GE Energy

D25 IED

User's Manual

994-0081

Version 3.00 Revision 1

imagination at work

General

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Important

The circuit boards in the D25 contain many electrostatically sensitive electronic components.

To prevent damage when handling these products use approved static control procedures.

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About This Document

Purpose

The purpose of this document is to provide users with information on how to install and commission a D25* IED. This guide also provides details on the operation and maintenance of D25 IEDs.

Intended Audience

This document is intended for readers who are installing or maintaining a D25 IED. Readers are assumed to have background knowledge of substation automation equipment and practices.

Additional Documents

For further information about the D25 IED, refer to the following documents:

- *D25 Multifunction IED Installation and Maintenance Guide* (994-0023) for obsolete parts and older generations of D25s
- *D25 Plant I/O Subsystem Configuration Guide* (P097-0CG)
- *68K Monitor User's Guide* (SWM0023)
- *ConfigPro* Online Help*
- *WESMAINT II+ User's Guide* (B014-1UG)
- *All related Product Bulletins*

Document Scope

The following part numbers are not covered by this document. For information on these parts, please refer to the *D25 Multifunction IED Installation and Maintenance Guide (994-0023).*

For upgrading information and understanding the compatibility between the new parts and obsolete parts, refer to Product Bulletin *PRBT-0233 D25 Parts Compatibility and Upgrade Guide.*

Main Boards	
504-0005	D25 WESDAC Type II
504-0010	D25 WESDAC Type II, 2MB Flash
Power Supplies	
521-0118	D25 HV Power Supply, 140 - 300 VDC / 240 VAC, 24V Wetting
521-0119	D25 Power Supply, 20 - 60 VDC, 48V Wetting
521-0124	D25 Power Supply, 70 - 150 VDC, 24V Wetting
521-0135	D25 Power Supply, 60-150 VDC / 120 VAC, 24V Wetting
521-0136	D25 HV Power Supply, 250 VDC / 220 VAC, 24V Wetting
521-0138	D25 HV Power Supply, 250 VDC / 220 VAC, 48V Wetting
521-0139	D25 Power Supply, 60-150 VDC / 120 VAC, 48V Wetting
DC Analog Card	
517-0397	D25 DC Analog I/P 8 Channel +/- 5V
517-0404	D25 DC Analog I/P 8 Channel +/- 1mA
517-0405	D25 DC Analog I/P 8 Channel +/- 5mA
517-0406	D25 DC Analog I/P 8 Channel +/- 10mA
517-0407	D25 DC Analog I/P 8 Channel +/- 20mA
517-0408	D25 DC Analog I/P 16 Channel +/- 1mA
517-0409	D25 DC Analog I/P 16 Channel +/- 5mA

Search Technical Support, Continued

Document Scope (continued)

517-0410	D25 DC Analog I/P 16 Channel +/- 10mA
517-0411	D25 DC Analog I/P 16 Channel +/- 20mA
517-0413	D25 DC Analog I/P 16 Channel +/- 5V
517-0416	D25 DC Analog I/P 8 Channel Scalable Adapter
517-0417	D25 DC Analog I/P 16 Channel Scalable Adapter
Status Cards	
517-0402	D25 Status Card, 32 Channel, 24V, 5mA
517-0403	D25 Status Card, 32 Channel, 48V, 5mA
517-0425	D25 Status Card, 32 Channel, 12V, 10mA
517-0426	D25 Status Card, 32 Channel, 120V, 0.75mA
517-0427	D25 Status Card, 32 Channel, 12V, 5mA
517-0428	D25 Status Card, 32 Channel, 250V, 0.75mA
517-0431	D25 Status Card, 16 Channel, 48V, 5mA
517-0432	D25 Status Card, 16 Channel, 24V, 5mA
517-0433	D25 Status Card, 16 Channel, 12V, 5mA
517-0434	D25 Status Card, 16 Channel, 120V, 0.75mA
517-0435	D25 Status Card, 16 Channel, 250V, 0.75mA
AC Input	
504-0008	D25 Analog Interface Card (Gen 1)
504-0009	D25 Analog Interface Card (Gen 2)

Product Support

If you need help with any aspect of your GE Energy product, you have a few options.

Search Technical Support

The GE Energy Web site provides fast access to technical information, such as manuals, release notes and knowledge base topics. Visit us on the Web at:

www.ge.com/energy

Contact Customer Service

The GE Energy Customer Service Center is open 24 hours a day, seven days a week for you to talk directly to a GE representative.

In the U.S. and Canada, call toll-free: 1.800.361.3652

International customers, please call: + 1 403.214.4600

Or e-mail to ge4service@ge.com

Product Returns

A Return Merchandise Authorization (RMA) number must accompany all equipment being returned for repair, servicing, or for any other reason. Before you return a product, please contact GE Energy to obtain a Return Merchandise Authorization number and complete instructions for return shipments.

Have the following information ready to give to customer service:

- Ship to address (the address that the product is to be returned to)
- Bill to address (the address that the invoice is to be sent to)
- Contact name
- Contact phone number
- Contact fax number
- Contact e-mail address
- Product number / serial number
- Description of problem

The call centre will provide you with a case number for your reference. This case number is NOT the RMA number. You will be sent the RMA number and RMA documents via fax or e-mail. Once you receive the RMA documents, attach them to the outside of the box that your product is packaged in and send the product to GE.

Note: Product returns *will not* be accepted unless accompanied by the Return Merchandise Authorization number.

Chapter 1: Before You Start

Product Safety

Resolving Problems

If you attempt to resolve problems with your GE product using methods not recommended by GE Energy, this might result in damage or injury to persons and property.

Safety Precautions

Follow all safety precautions and instructions in this manual:

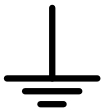
- Only qualified personnel should work on the D25. Maintenance personnel should be familiar with hazards associated with electrical equipment.
- All AC voltage and current terminals are protected from accidental contact by mechanical safety shields. The D25 is designed so that field wiring does not have to be touched or disconnected when removing printed circuit boards (PCBs).
- **Always use the puller that is provided** to remove Modules that hold potentially hazardous voltages. This is located inside the D25 front cover on the edge of the Indicator Switch Card.
- The CONTROLS switch on the front panel of the D25 has a mechanical protector to prevent accidental operation of the switch. The switch can be locked in the Local or Remote position.
- All components within the D25 are susceptible to damage from electrostatic discharge. Observe standard ESD precautions.

Product Safety, Continued

Warning Symbols on Enclosure Back Panel

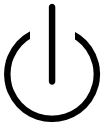
Caution (refer to accompanying documentation)

Caution Risk of electric shock



Earth Ground Terminal

Protective Ground Terminal



Power Supply Off (Stand-by Mode)

Power Supply On

Hazardous Voltages

Hazardous Voltages can cause shock, burns or death.

- Disconnect and lockout all power sources before servicing and removing components.
- Short all current transformer primaries before servicing.

Patent Protection Label

A label similar to the one shown below on the rear panel of the D25 enclosure. It is a formal notification of the US patents that protect the product and the technology developed by GE Energy

MAY BE PROTECTED BY ONE OR MORE OF
THE FOLLOWING US PATENTS:
5237511, 5303112, 5513061, 5701226

Product Safety, Continued

Operating Environment

- The D25's enclosure is intended for indoor use primarily to provide protection against accidental contact with the enclosed modules and voltages.
  - Do not place the product in environments where unusual conditions exist (windblown dust and dirt, liquids, etc.) without a secondary protective enclosure.
- Never operate the D25 in the field with front panel open.
  - Operating the unit with the front panel open may alter product performance specifications, and result in component damage from debris.

Operation in Residential Areas

The D25 generates radio frequency energy. If it is not operated and used in accordance with the instructions provided in this guide, it may cause harmful interference to radio communications in a residential area. Users are required to correct interference at their own expense.

Protection During Maintenance

Ensure that the D25 is protected from falling debris during maintenance.

Small metallic particles (such as wire clippings) can fall through the ventilation holes on the top of the unit, possibly damaging or interfering with the safe and reliable operation of the D25.

If you cover the unit for maintenance, remove the cover before operating to provide adequate cooling airflow.

Grounding

Make sure that the metal case is grounded at the protective ground stud located at the top-left corner of the rear of the enclosure.

Connection must be provided with separate green/yellow wire connected between the D25 and the protective earth system of the facility.

Use of this equipment in a manner not recommended or specified by GE Energy may impair the protection provided by the equipment.

Warning

The high voltage area of the D25 High Current KE Digital Output Module is in close proximity to the D25 chassis. Ensure that relay contacts are de-energized before removing the D25 HCKE DO Module.

Product Overview

What is the D25?

The D25 is a standalone intelligent electronic device that can operate as:

- Programmable logic controller (PLC)
- Substation LAN node
- IED gateway
- Bay level controller
- Power quality monitor
- Fault/event (waveform) recorder

It is suitable for various power system applications, including:

- Substation monitoring
- Control
- Automation applications

Main Features and Options

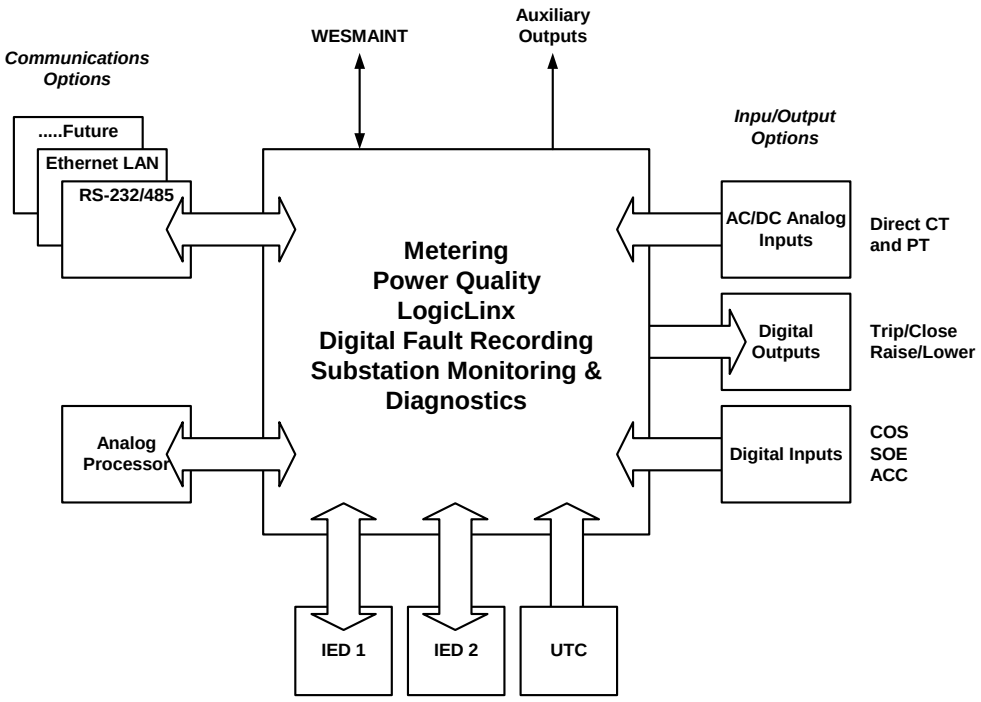
The multi-processor design allows many functional options:

- Expansion cards
- Configurable digital inputs, digital outputs, AC and DC analog inputs
- LCD and Graphics Display front panels

Communication plug-in options:

- LAN: connection to iSCS Ethernet LAN with fiber optic, twisted pair or coaxial
- Serial: user selectable from RS-232 or RS-485

Functional Overview



Chapter 2: Installing the D25

Installation Tools List

Installation Tools List

Before you begin the install of the D25, gather the following:

- A Flat Screwdriver with 0.6x3.5 mm blade (for terminal block wiring)
- A #2 Phillips Screwdriver (for rack mounting the unit)
- Wire Cutters
- Wire Strippers
- Wire Crimping Tool
- Tie-wraps (for gathering extra wire)
- Multi-meter (for testing points)

Installation Steps

Procedure

Follow these steps to install the D25:

Step	Action
1	Unpack the D25.
2	Using the *First Look at the D25* section of this guide, inspect the D25 for damage. Note: Report any damage immediately to GE Energy. See: *Product Safety* for contact details.
3	Install the D25. Follow the procedure set out in Chapter 3: *Connecting Field Wiring*.
4	Carry out all field wiring connections and jumper settings configuration as set out in Chapter 4: *Powering-up and Testing*: • Power • Serial and Ethernet communication • Input and output pinouts
5	Power-up the D25 and check for normal operation. See Chapter 4: *Powering-up and Testing*. Some testing requires that code and configuration files have been downloaded to the D25. If the front panel Power and Run LEDs do not show normal operation, then use WESMAINT to inspect the error messages from the self-diagnostics and ascertain what is malfunctioning.

Installation Steps, Continued

6	If the FLASH memory has been deleted or corrupted, then you need to download the code and configuration files. See Chapter 5: *Configuring the D25 Software*.
7	If you have to download code and configuration files, then go back to step 5 and verify that the D25 is now operating correctly.

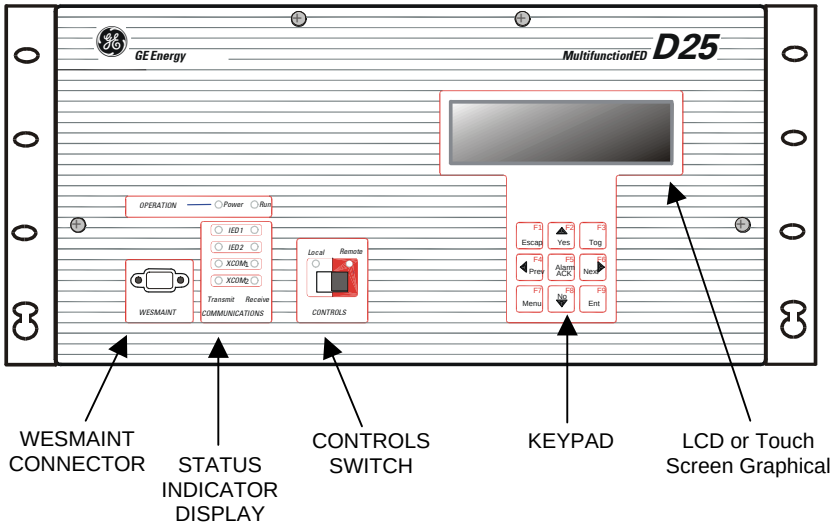
Note

If you are replacing a component that is already installed on the D25 or upgrading a specific component, then see Chapter 8: *Upgrading and Replacing D25 Modules*.

First Look at the D25

Front Panel

- WESMAINT II+ connector for connecting a maintenance terminal or PC
- LEDs for information on status, operation and traffic on communication ports
- CONTROLS switch for setting Local or Remote operational state of the digital output module
- Optional LCD Display to display selected data stored in the D25 database
- Keypad for using the menus shown on the LCD Display. Only present if LCD option is included



Back Panel

The D25 back panel is modular with removable sections. The types and number of connectors are specified when the unit is ordered but can be changed in the field.

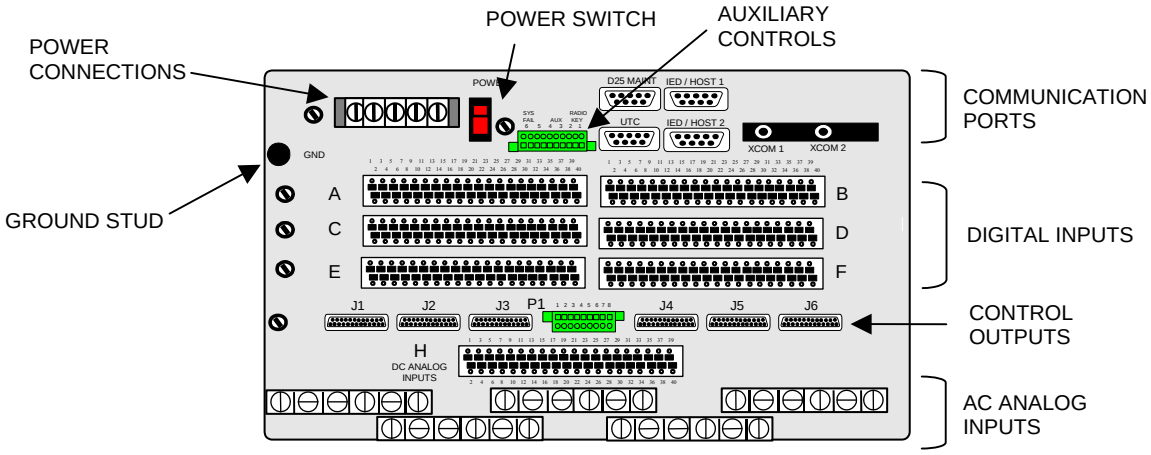
There are two back panel options for the D25KE control board:

- Termination with six DB-25 connectors
- Termination with two FACE40 connectors

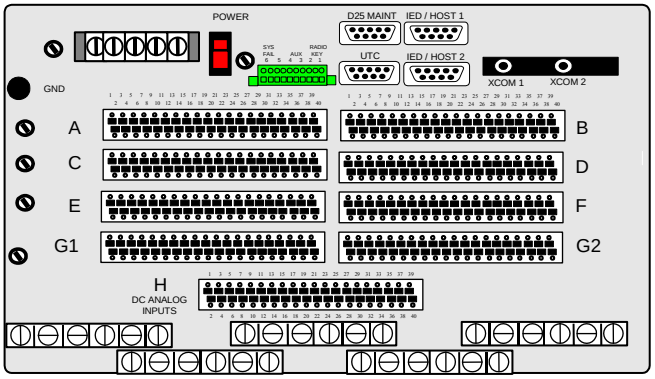
First Look at the D25, Continued

Back Panel Diagrams

With six DB-25 connectors:



With two FACE-40 connectors:



Part Number

The part number label on the rear of the enclosure identifies the D25 options at the **time of delivery**

- Each digit in the part number indicates the options included in the D25
- If the D25 is modified after delivery, the part number may no longer represent the options accurately
- Update the part number label to match any option changes made after delivery

See Appendix C: *Ordering Information.*

Physical Mounting

19" Rack Physical Mounting

To mount the D25 in a rack:

1. Align the D25 in the desired position in a 19-inch mounting rack.
2. Holding the D25 firmly in place in the rails of the mounting rack, install and tighten the four rack screws.

You are now ready to connect all power and field wiring to the back of the D25, see Chapter 3: *Connecting Field Wiring*.

Rack Spacing

When mounting multiple D25s in a rack (or if mounting a D25 in a rack with other equipment) verify that there is at least one rack unit (RU) space above and below the D25 to allow for cooling airflow.

1 RU = 1.75 inches (44.5mm)

Required Clearances

The exterior dimensions of the standard D25 enclosure are:

- 19" length x 9" deep x 8.75" high (483mm x 227mm x 222mm)

Clearance:

- Allow approximately 14 inches (356 mm) of total cabinet depth to provide clearance for hardware on the front panel, and interface cables on the rear.

Wiring Rod Installation

The optional D25 Wiring Rod assembly supports field wiring and prevents undue stress on the connectors on the rear of the D25.

You require:

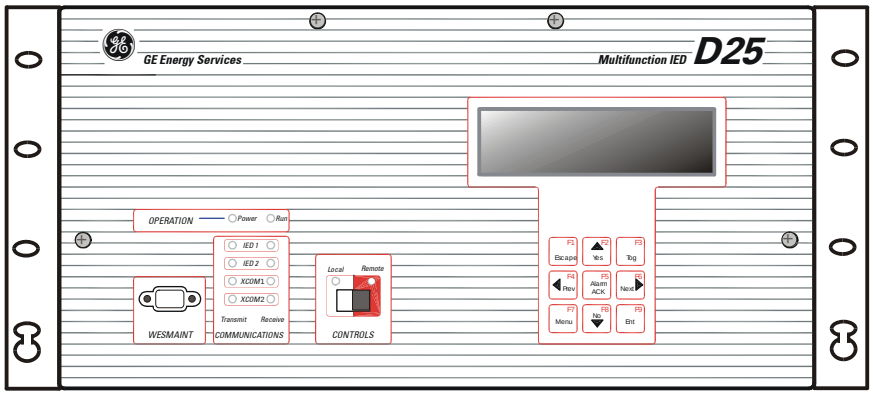
- Wire Rod Assembly, Part Number: 953-4029
- 2 - 6-32 - ½ inch LG Screws (screws removed from enclosure may be re-used, if they are ½ inch long)

Mount the Wiring Rod on the back of the unit at a height where it will support cables attached to the DB-25 or FACE-40 connectors.

LCD Panel Overview

LCD Panel Diagram

A Liquid Crystal Display Panel (LCD) option has been made available for applications where alphanumeric front-panel display of analog and digital system input points is desired.



This diagram shows a D25 front panel with the LCD option installed.

Detailed Description

The touch-sensitive keypad below the LCD display can be used to navigate through the display to show a set of select analog and digital input points.

The Data Display panel option is also available in a rack-mounted version that can be linked, using the RS-485 multidrop technique.

Components of an LCD Panel System

A D25 must have these components to support an LCD system:

Hardware:	Part #
– D25 Front Panel	953-3135
– LCD Text Display	540-0248
– LCD Circuit Board Assembly.	540-0256
– Ribbon Cable Assembly	976-0125

Continued on next page

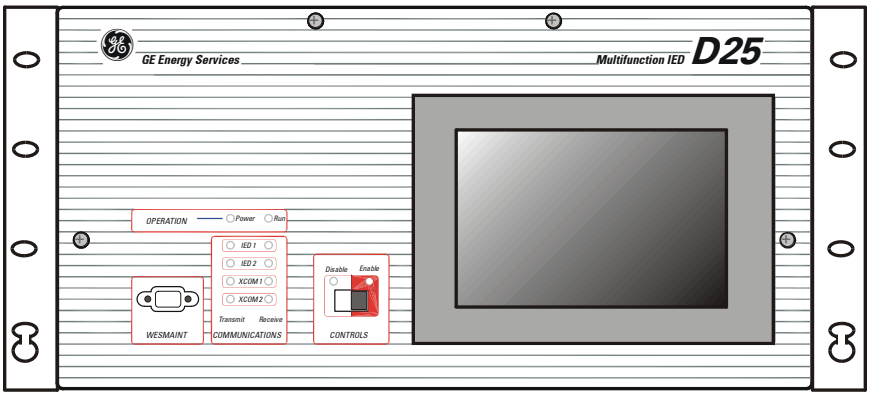
LCD Panel Overview, Continued

Configuring The Software	A D25 fitted with an LCD panel must be equipped with the Data Display DTA (B062) application software to communicate with the panel. Using Config Pro, specific D25 database input points are mapped into this software.
LCD Hardware Connections	A flat ribbon cable (Part # 976-0125) connects from the LCD card (Part # 540-0256) to the Indicator Switch card (Part # 540-0412) which is also mounted on the inside of the front door of the D25 enclosure. This cable is both the data and power connection to the LCD card.

Graphic Display Panel Overview

GDP Diagram

A Graphic Display Panel (GDP) option has been made available for applications where graphic front-panel display and control of system inputs and outputs is desired.



This diagram shows a D25 front panel with the GDP option installed.

Detailed Description

The touch-sensitive GDP can display a selection of customized graphic displays, each representing a set of analog and digital input and output points.

Using the touch-sensitive screen, an operator can select various displays, select points to monitor and issue control commands

Components of a GDP

A D25 must have these components to support a GDP system:

Hardware:	Part #
– D25 Front Panel	953-3136
– GDP module	580-1186
– Ribbon Cable Assembly	976-0126
– Ribbon Cable Assembly	976-0127
– PSA module	521-0131

Continued on next page

Graphic Display Panel Overview, Continued

What Can a GDP be Used For?

The GDP can eliminate the need for discrete substation devices.

For example, the GDP can be used in place of the following devices:

- circuit breaker control switch and semaphore
- disconnector / earth switch and semaphore
- ammeter, and ammeter selector switch
- voltmeter, and voltmeter selector switch
- MW meter
- power factor meter
- alarm annunciator panel
- mimic diagram.

IMPORTANT

There are jumper settings at the back of the GDP unit that are set at the factory. These settings shall not be changed and any modification to them may cause damage to the GDP or other modules of the D25.

A D25 equipped with a GDP has these limitations:

- Only external status wetting can be used when the GDP is installed.
  - the D25's power supply field O/P is used exclusively to power the GDP.
  - connecting another external load to the field O/P will affect isolation, and possibly overload the power supply.
- The GDP reduces the normal -20° to +70°C operational temperature rating of the D25 to 0° to +50°C.
- The 20-60 V_{DC} D25 power supply is not available with the GDP.

Configuration of a GDP

Configuring a GDP's Software

A D25 fitted with a GDP must be equipped with Modbus DPA (A059) or DNP 3.0 DPA application software to communicate with the GDP. Using Config Pro, some or all of the D25's database points are mapped into this communication software.

Inside the GDP, these points are then mapped into the GDP graphic objects.

Note: Please contact GE for assistance in order to learn more about the configuration tools and settings available for GDP.

GDP Hardware Connections

When installed, the PSA module (part # 521-0131) is mounted over the right-hand side of the D25's DAC board, where it plugs onto the three sets of digital input wetting jumpers (see *Low-Voltage Digital Input Card Wetting* on p. 109 for more detail on these jumpers). The PSA taps into the main D25 power supply's field output through these jumpers.

A flat ribbon cable (Part # 976-0126) connects from the PSA card to the Indicator Switch card (Part # 540-0412) mounted on the inside the front door of the D25 enclosure. This cable is the data connection to the GDP.

Another cable (Part # 976-0127) links the PSA card to the GDP. This cable is both the DC power connections from the PSA to the GDP, as well as the RS-485 data interface.

Chapter 3: Connecting Field Wiring

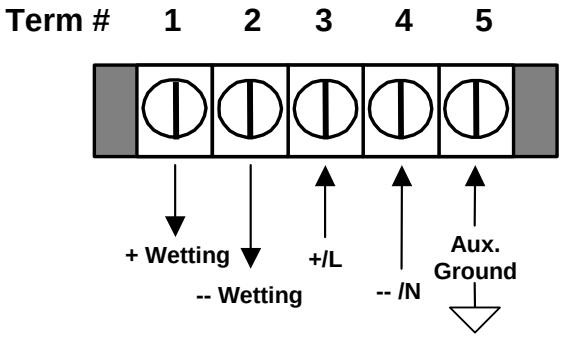
This Section Use this section to:

- Make all field wiring connections
- Set external jumper configurations
- Configure Serial and Ethernet ports

Power Supply

Power Supply

A label on the back panel outlines the actual power connection points for the Power Supply option installed.



+ Wetting Supply Output

Either +24V or +48V according to the power supply option specified.

- Wetting Supply Output

Either -24V or -48V according to the power supply option specified.

+/L Input

- Positive if using DC power supply
- Line if AC power supply

-/N Input

- Negative if DC power supply
- Neutral if AC power supply

Grounding

Connect the protective ground stud before operating the D25

Use the ground stud for shielding

External Overcurrent Protection

The D25 power supply input must be externally protected:

- AC mains supplies shall be fused at no more than 15A, or
- DC mains supplies shall be fused at no more than 10A

Power Supply, Continued

Power Supply Source

- An IEC® 60947 compliant main disconnect switch (or other equivalent device complying with IEC 60947-1/60947-3) must be as electrically close as practical to the D25 power supply.
- For the switching power supply to operate correctly, the input voltage must be within specified limits prior to turning on the power switch.
- DC power supply modules draw an inrush current upon start-up.
  - Ensure the field source can supply this start-up current without overloading.
- Use the field supply outputs *only* when external supplies are not available.
  - Use of an external supply improves immunity to EMI and increases power supply efficiency.

Digital Inputs

Digital Input Module

Note**:** The inputs of all variants of the S Cards are *not* polarity sensitive: they are bipolar, and are isolated from the D25's internal power supply.

Digital Inputs

The D25 can have up to 96 digital inputs in three banks of 32:

- Digital Inputs 1 to 32 are on connectors A and B
- Digital Inputs 33 to 64 are on connectors C and D
- Digital Inputs 65 to 96 are on connectors E and F

Wetting Types

All digital inputs require an input voltage signal large enough to turn on an optical switch. The input levels required for each D25 digital input card type are shown in the table below.

- Low Voltage Digital Input cards can each be set to use:
  - Externally routed PSU supplied wetting (Supplied Wetting)
  - External wetting
  - Externally applied input voltage (Voltage Detect)
- High Voltage Digital Input cards can each be set to use:
  - External wetting
  - Externally applied input voltage (Voltage Detect)

Digital Inputs, Continued

Digital Input Thresholds

The table shows the on and off state thresholds for each of the listed D25 digital input card options. Before connecting field wiring, refer to the table to determine the suitability of the installed option.
Verify that inputs do not exceed the maximum overload voltage, or damage to the card may result.

Card Type	32 Input Part #s	On Threshold	Off Threshold	Overload Voltage	Max. Power Dissipation/ Input
Low Voltage Digital Input Cards					
12V / 5 mA	517-0485	>8 V	<4 V	16.8 V	130 mW
24V / 5 mA	517-0486	>18 V	<10 V	33.6 V	210 mW
24V / 10 mA	517-0490	>18 V	<10 V	33.6 V	530 mW
48V / 5 mA	517-0487	>35 V	<16 V	67.2 V	470 mW
High Voltage Digital Input Cards					
120V / 1.6 mA	517-0488	>80 V	<40 V	144 V	290 mW
250V / 1.2 mA	517-0489	>160 V	<80 V	300 V	450 mW

Note

The inputs of all variants of the D25 digital input cards are *not* polarity sensitive: they are bipolar, and are isolated from the D25's internal power supply.

Fuse Monitoring

D25 digital input modules include circuitry that detects the presence of wetting voltage *after* it has passed through the fuse F1.

Software in the D25 Plant I/O Subsystem (P097 V2.30 or greater) responds to the signals from each of the three D25 digital input modules and creates pseudo digital inputs that can be seen in the D25 System Point Database.

If fuse F1 opens or the wetting voltage is removed from the digital input module for any reason, the pseudo DI for that module will change state and set an alarm. If a D25 digital input module is not present, the pseudo DI point will remain in the *Off* state.

Note: Fuse monitoring can only detect a wetting voltage if the D25 digital input module is configured for *supplied* or *external* wetting.

If the module is configured for *voltage detect* the fuse monitoring circuitry will not sense any wetting voltage, and remains in the *Off* state

Digital Inputs, Continued

Digital Input Field Connections

Field wiring for all variations of Digital Input modules are made through two FACE-40 connectors for each module on the backplane of the D25 enclosure. These connectors are provided *only* if a digital input module is installed in the D25.

Digital Input Wetting Selection

Wetting supply source *must* be provided externally and independently for each digital input card.

To use external or supplied wetting:

- Connect external wetting supply to pins 1 and 2 on FACE-40 Connector A, C and/or E.

To use the voltage detect input:

- Connect (jumper) pins 1 and 2 on Connector A, C and/or E for each module(s).

Note**:** Internal wetting voltage to Digital Cards is no longer available. Please refer to Product Bulletin PRBT-213.

External Power Sources

While all of the 32 inputs are bipolar and not polarity sensitive, the "B" sides of all inputs are linked together.

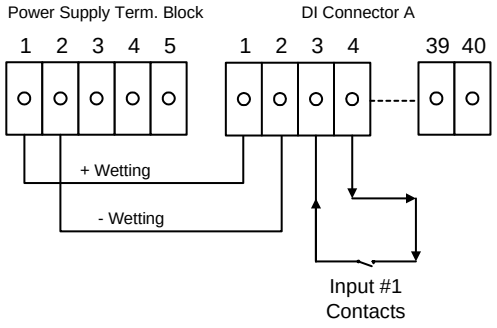
- Use care when connecting multiple external power sources.

For external wetting, the three digital input modules can have independent wetting configurations and wetting voltage sources.

Digital Inputs Supplied Wetting (Externally routed)

Supplied Wetting is when the voltage applied to the inputs originates from the power supply internal to the D25, routed externally to the DI Cards. The digital input is "turned on" simply by closing a contact across the two input termination points.

Connections for digital input point number 1.



Notes

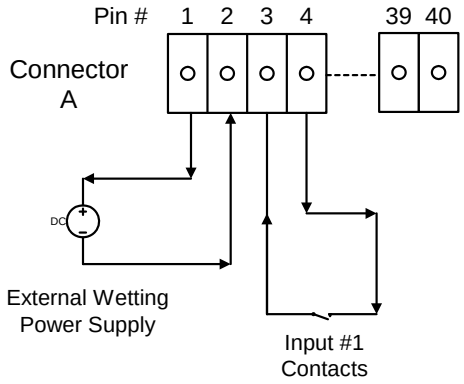
This option is available for 24 and 48V low-voltage DI cards, *only.* Supplied Wetting option is **not** available if the Graphics Display panel is installed because it reduces the isolation, increasing the D25 unit's susceptibility to EMI and transient interference.

Digital Inputs, Continued

Digital Inputs External Wetting

With External Wetting, operation of the digital inputs is essentially the same as for Supplied Wetting, except that the voltage that is switched at the input terminals is supplied by an external (non-D25) source. The external power source is connected to pins 1 and 2 of Connector(s) A, C or E, for each of the three Digital Input cards respectively.

Connections for digital input point number 1:



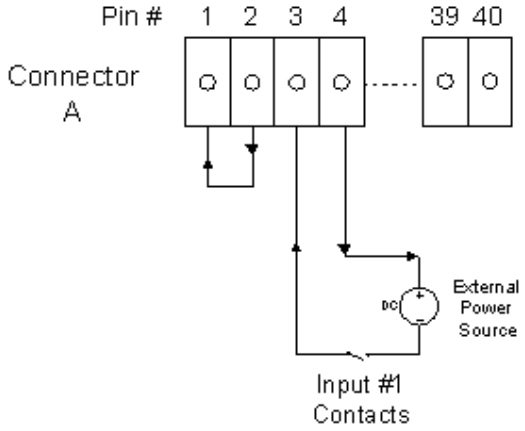
Voltage Detect

In this type of input, the D25 does not provide the wetting power source, from either its own power supply, or from an external battery.

Note: Pins 1 and 2 of Connector(s) A, C or E are jumpered for each board using this configuration.

If using more than one external power source, they must share a common return, and it must be connected to the "B" input termination for each input point.

Connections for digital input point number 1:



Digital Inputs, Continued

Table: Digital Inputs Pinouts 1-32 Pinouts for Digital Inputs 1 through 32:

Pin	Connector A	Connector B
1	Wetting Voltage	Reserved
2	Wetting Voltage	Reserved
3	DI 1A	DI 17A
4	DI 1B	DI 17B
5	DI 2A	DI 18A
6	DI 2B	DI 18B
7	DI 3A	DI 19A
8	DI 3B	DI 19B
9	DI 4A	DI 20A
10	DI 4B	DI 20B
11	DI 5A	DI 21A
12	DI 5B	DI 21B
13	DI 6A	DI 22A
14	DI 6B	DI 22B
15	DI 7A	DI 23A
16	DI 7B	DI 23B
17	DI 8A	DI 24A
18	DI 8B	DI 24B
19	Reserved	Reserved
20	Reserved	Reserved
21	Reserved	Reserved
22	Reserved	Reserved
23	Reserved	Reserved
24	Reserved	Reserved
25	DI 9A	DI 25A
26	DI 9B	DI 25B
27	DI 10A	DI 26A
28	DI 10B	DI 26B
29	DI 11A	DI 27A
30	DI 11B	DI 27B
31	DI 12A	DI 28A
32	DI 12B	DI 28B
33	DI 13A	DI 29A
34	DI 13B	DI 29B
35	DI 14A	DI 30A
36	DI 14B	DI 30B
37	DI 15A	DI 31A
38	DI 15B	DI 31B
39	DI 16A	DI 32A
40	DI 16B	DI 32B

Digital Inputs, Continued

Table: Digital Inputs Pinouts 33-64 Pinouts for Digital Inputs 33 through 64:

Pin	Connector C	Connector D
1	Wetting Voltage	Reserved
2	Wetting Voltage	Reserved
3	DI 33A	DI 49A
4	DI 33B	DI 49B
5	DI 34A	DI 50A
6	DI 34B	DI 50B
7	DI 35A	DI 51A
8	DI 35B	DI 51B
9	DI 36A	DI 52A
10	DI 36B	DI 52B
11	DI 37A	DI 53A
12	DI 37B	DI 53B
13	DI 38A	DI 54A
14	DI 38B	DI 54B
15	DI 39A	DI 55A
16	DI 39B	DI 55B
17	DI 40A	DI 56A
18	DI 40B	DI 56B
19	Reserved	Reserved
20	Reserved	Reserved
21	Reserved	Reserved
22	Reserved	Reserved
23	Reserved	Reserved
24	Reserved	Reserved
25	DI 41A	DI 57A
26	DI 41B	DI 57B
27	DI 42A	DI 58A
28	DI 42B	DI 58B
29	DI 43A	DI 59A
30	DI 43B	DI 59B
31	DI 44A	DI 60A
32	DI 44B	DI 60B
33	DI 45A	DI 61A
34	DI 45B	DI 61B
35	DI 46A	DI 62A
36	DI 46B	DI 62B
37	DI 47A	DI 63A
38	DI 47B	DI 63B
39	DI 48A	DI 64A
40	DI 48B	DI 64B

Digital Inputs, Continued

Table: Digital Inputs Pinouts 65-96 Pinouts for Digital Inputs 65 through 96.

Pin	Connector E	Connector F
1	Wetting Voltage	Reserved
2	Wetting Voltage	Reserved
3	DI 65A	DI 81A
4	DI 65B	DI 81B
5	DI 66A	DI 82A
6	DI 66B	DI 82B
7	DI 67A	DI 83A
8	DI 67B	DI 83B
9	DI 68A	DI 84A
10	DI 68B	DI 84B
11	DI 69A	DI 85A
12	DI 69B	DI 85B
13	DI 70A	DI 86A
14	DI 70B	DI 86B
15	DI 71A	DI 87A
16	DI 71B	DI 87B
17	DI 72A	DI 88A
18	DI 72B	DI 88B
19	Reserved	Reserved
20	Reserved	Reserved
21	Reserved	Reserved
22	Reserved	Reserved
23	Reserved	Reserved
24	Reserved	Reserved
25	DI 73A	DI 89A
26	DI 73B	DI 89B
27	DI 74A	DI 90A
28	DI 74B	DI 90B
29	DI 75A	DI 91A
30	DI 75B	DI 91B
31	DI 76A	DI 92A
32	DI 76B	DI 92B
33	DI 77A	DI 93A
34	DI 77B	DI 93B
35	DI 78A	DI 94A
36	DI 78B	DI 94B
37	DI 79A	DI 95A
38	DI 79B	DI 95B
39	DI 80A	DI 96A
40	DI 80B	DI 96B

Control Outputs

Control Module

The control module can be configured for two basic modes of operation:

- Trip/Close (T/C) – excluding D25 High Current KE Control Card
- Digital Output (DO)

Any other type of operation, such as Raise/Lower, uses the Digital Output hardware configuration.

T/C or DO (R/L) Sensing

D25 software detects what type of digital output command has been received, and uses the Master Trip and Master Close relays when appropriate.

External jumpering is provided to route the external Control Voltage through the correct relays for each mode of operation.

Fuse Monitoring

The control module includes circuitry that detects the presence of control voltage on the load side of the fuses. Software in the D25 Plant I/O Subsystem (P097 V2.30 or greater) responds to the signal from the control module and creates a pseudo digital input that can be seen in the D25 System Point Database.

If a fuse opens, or the control voltage is removed from the digital output module for any reason, the pseudo digital input (DI) for that module will change state and set an alarm.

If the control module is not present, the pseudo DI point will remain in the *Off* state.

Note 1: The fuse monitoring circuitry can only detect a control voltage above approximately 10 Vdc. If the control voltage is less than this level, the fuse monitoring circuitry will not sense any voltage, and the pseudo DI point will remain in the *Off* state.

Note 2: Fuse monitoring works with (+) ve or (-) ve grounded systems.

Note 3: For D25s with Plant I/O Version 2.30, the fuse-monitoring feature will only work with DC control voltages. Versions greater than 2.30 support AC control voltage monitoring.

Note 4: The D25 High Current Control Card does not have a fuse and a fuse monitoring circuit.

Caution

The fuse monitoring circuitry has been engineered to detect control voltages up to the supported maximum specifications of the module. *Do not* exceed this level of control voltage. Damage to the module may result.

Note

The D25 KE control module *does not* require hardware configuration to use the fuse-monitoring feature.

Control Outputs, Continued

D25KE Module External Connections

The D25KE Control Module contains (up to) 32 digital output relays, either:

- divided into (up to) 4 groups of 8 relays
  - each group is separately configurable as trip/close (T/C) pairs, or raise/lower (R/L) pairs via field selectable jumpers
- divided into (1 or) 2 groups of 8 pairs of relays (D25KE-4Z Card)
  - each group is separately configurable as T/C or R/L

D25KE Variations

The D25KE control modules are available in two variations:

- with 6 DB-25 connectors for field wiring and one 8-pin compression terminal block for optioning
- with up to 2 FACE-40 connectors for field wiring and optioning

---

About D25 KE Rear Panels

All DB-25 type D25KE modules are installed in a D25 enclosure that has six DB-25 connectors on the backplane, regardless of how many channels the KE board has.

- a 16 channel DB-25 KE module will have two DB-25 connectors that will not be used.

A D25 KE module installed in an enclosure with FACE-40 connectors will *only* have the connectors necessary to support the number of channels in use.

- 32 channel D25 KE module will have two FACE-40 connectors, 16 channel module will have only one FACE-40 connector installed.

Output Options

The 32 D25KE digital outputs are divided into up to four groups of eight relays.

- Each of the four groups is independently configurable as Trip/Close pairs or Raise/Lower Digital Outputs.

External Jumper Configuration

- Insert wire jumpers in the rear 8-pin compression type connector P1 to configure the D25KE DB-25 module.

Note: Use GE Energy quad-wire jumper, part # 970-0264, or make an equivalent jumper, as desired.

- Jumper the two FACE-40 connectors G1 and G2 to configure the D25KE FACE-40 module.

Control Outputs, Continued

Table: D25KE DB-25 Connector Pinouts J1 to J3

The DB-25 connector pinouts for D25KE outputs 1 through 16.

Note: TRPx = Trip output point x

CLSx = Close output point x

NC = Not Connected

J1 DB-25 Pin	Signal	J2 DB-25 Pin	Signal	J3 DB-25 Pin	Signal
1	TRP1	1	TRP9	1	TRP1
2	CLS1	2	CLS9	2	TRP2
3	TRP2	3	TRP10	3	TRP3
4	CLS2	4	CLS10	4	TRP4
5	TRP3	5	TRP11	5	TRP5
6	CLS3	6	CLS11	6	TRP6
7	TRP4	7	TRP12	7	TRP7
8	CLS4	8	CLS12	8	TRP8
9	TRP5	9	TRP13	9	TRP9
10	CLS5	10	CLS13	10	TRP10
11	TRP6	11	TRP14	11	TRP11
12	CLS6	12	CLS14	12	TRP12
13	TRP7	13	TRP15	13	TRP13
14	CLS7	14	CLS15	14	TRP14
15	TRP8	15	TRP16	15	TRP15
16	CLS8	16	CLS16	16	TRP16
17	NC	17	NC	17-25	NC
18-25	COIL_SUP_RTN	18-25	COIL_SUP_RTN		

Control Outputs, Continued

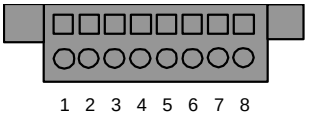
Table: D25KE DB-25 Connector Pinouts J4 to J6 The DB-25 connector pinouts for D25KE outputs 17 through 32.

J4 DB-25 Pin	Signal	J5 DB-25 Pin	Signal	J6 DB-25 Pin	Signal
1	TRP17	1	TRP25	1	TRP17
2	CLS17	2	CLS25	2	TRP18
3	TRP18	3	TRP26	3	TRP19
4	CLS18	4	CLS26	4	TRP20
5	TRP19	5	TRP27	5	TRP21
6	CLS19	6	CLS27	6	TRP22
7	TRP20	7	TRP28	7	TRP23
8	CLS20	8	CLS28	8	TRP24
9	TRP21	9	TRP29	9	TRP25
10	CLS21	10	CLS29	10	TRP26
11	TRP22	11	TRP30	11	TRP27
12	CLS22	12	CLS30	12	TRP28
13	TRP23	13	TRP31	13	TRP29
14	CLS23	14	CLS31	14	TRP30
15	TRP24	15	TRP32	15	TRP31
16	CLS24	16	CLS32	16	TRP32
17	NC	17	NC	17-25	NC
18-25	COIL_SUP_RTN	18-25	COIL_SUP_RTN		

Control Outputs, Continued

Table: D25KE DB-25 Control Function Terminal Block – P1

Phoenix 8-pin terminal block – P1 Pinout:



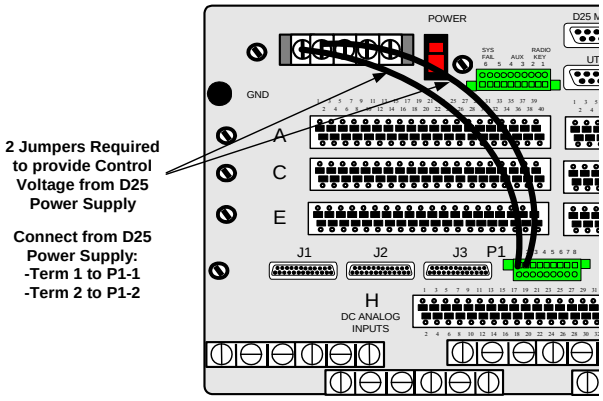
P1 Pin	Signal	Function	Comments
1	COIL_SUP	Control Voltage	Interposer Relay Coil Power Supply connections
2	COIL_SUP_RTN	Control Voltage return	
3	JMP1	Relays 1-8 mode jumper point	Jumper to Pin 1-5 (+VC) for R/L Jumper to Pin 1-6 (MT) for T/C
4	JMP2	Relays 9-16 mode jumper point	Jumper to Pin 1-5 (+VC) for R/L Jumper to Pin 1-6 (MT) for T/C
5	+VC	Control Voltage (fused)	Jumper to JMP1 through 4 for R/L
6	MT	Master Trip Bus	Jumper to JMP1 through 4 for T/C
7	JMP3	Relays 17-24 mode jumper point	Jumper to Pin 1-5 (+VC) for R/L Jumper to Pin 1-6 (MT) for T/C
8	JMP4	Relays 25-32 mode jumper point	Jumper to Pin 1-5 (+VC) for R/L Jumper to Pin 1-6 (MT) for T/C

Control Outputs, Continued

D25KE DB-25 Control Voltage Connections

Control voltage can be supplied by either an external power supply, or the D25's own power supply. In either case, connect the control voltage to P1 pins 1 and 2.

To provide control voltage using the D25 internal supply, connect as shown:



Note: The (external) control voltage can be up to 75 Vdc or 50 Vac.

Control Outputs, Continued

D25KE DB-25 Trip/Close Configuration

Through the use of "Master" relays, the 32 digital outputs can be configured as four groups of eight Trip/Close pairs, that is, 64 output connections.

Note: The Control Voltage can be up to 75 Vdc or 50 Vac. See page 143 for specifications of control outputs.

P1 connections for Trip/Close

Use jumper wires on the Control Function Terminal block P1 to configure:

Group 1:

- connect between MT (P1-6) and JMP1 (P1-3)

Group 2:

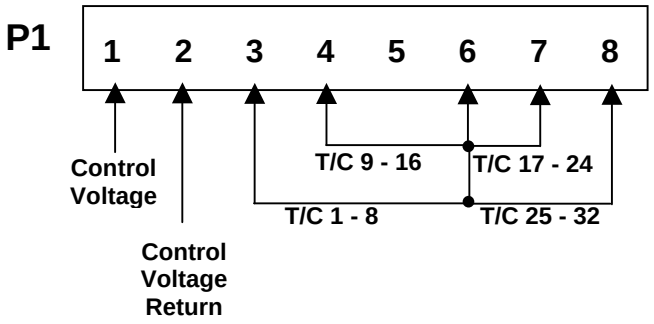
- connect between MT (P1-6) and JMP2 (P1-4)

Group 3:

- connect between MT (P1-6) and JMP3 (P1-7)

Group 4:

- connect between MT (P1-6) and JMP4 (P1-8)



Control Outputs, Continued

About the DB-25 Option

The D25KE DB-25 connector option is for use primarily with WESTERM D20 KI interposing relay panels (part numbers 517-0166 and 517-0167).

For this connection use a multi-conductor shielded DB-25 cable assembly.

Note

Ensure that the multi-conductor cable's shield drain wire is connected to pin 17 of the WESTERM D20 KI DB-25 connector.

Pin 17 of the D25KE DB-25 connector is not connected internally, and therefore, cannot be used as a drain connection.

Note

For Trip/Close operation, the cables used to connect the D25 control outputs to the D20 KI panels must have all DB-25 pins connected end-to-end.

- Use GE Energy part number 977-0208, or equivalent.

Trip/Close Connections to Interposing Relay Panels

The D25KE module requires four WESTERM KI interposing relay panels to support 32 pairs of Trip/Close digital outputs.

Note: For all KI relay panels, one of the Z1 jumpers must be installed to provide a return path for the control voltage. KI panels have these jumpers installed.

First group of eight digital outputs:

- Connect a DB-25 cable from J1 of the D25KE to J2 of the first WESTERM KI interposing relay panel.

Second group of eight digital outputs:

- Connect a DB-25 cable from J2 of the D25KE to J2 of the second WESTERM KI interposing relay panel.

Third group of eight digital outputs:

- Connect a DB-25 cable from J4 of the D25KE to J2 of the third WESTERM KI interposing relay panel.

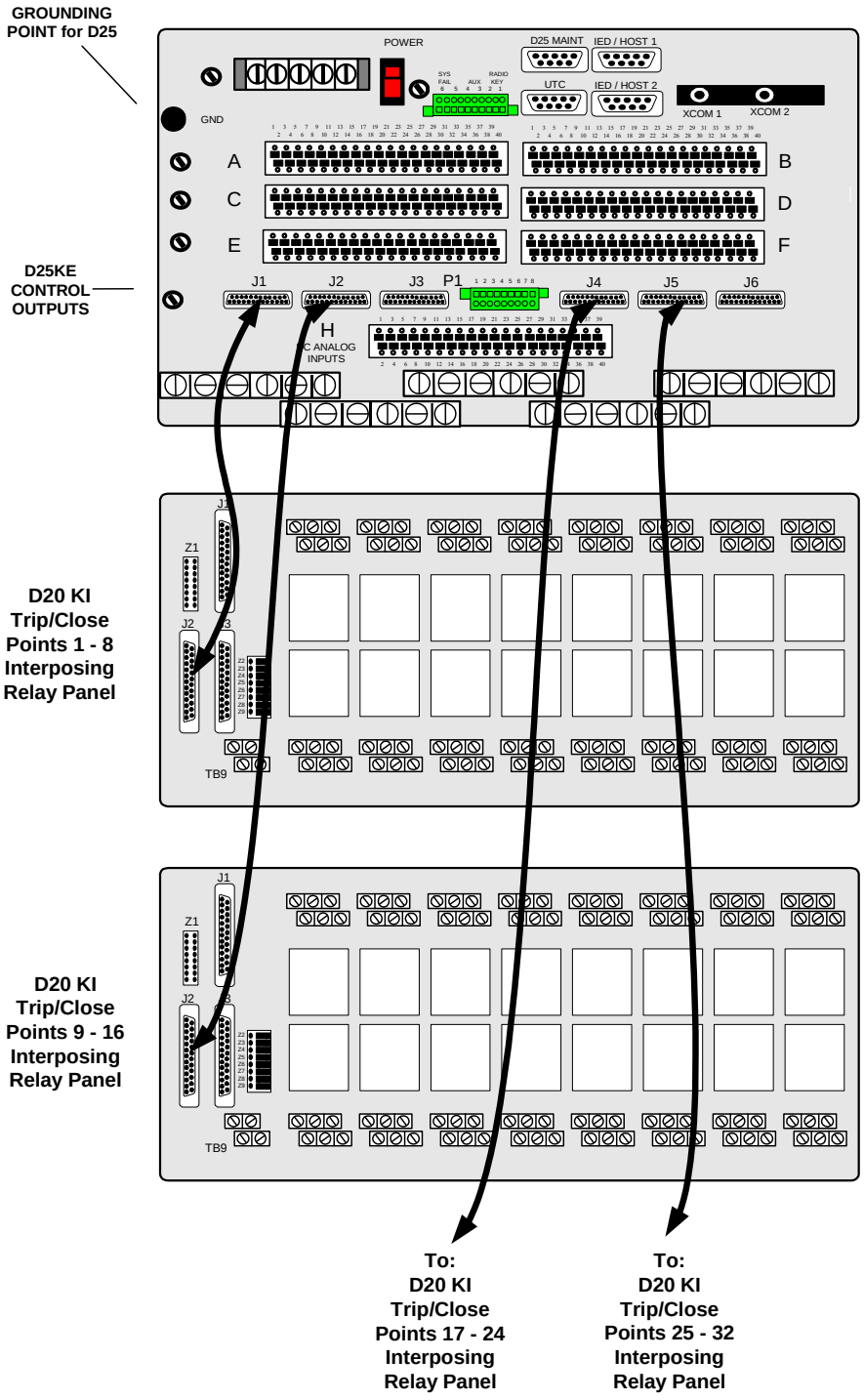
Fourth group of eight digital outputs:

- Connect a DB-25 cable from J5 of the D25KE to J2 of the fourth WESTERM KI interposing relay panel

Control Outputs, Continued

D25KE Trip/Close Connection Diagram

Shows the connections used when configuring a D25KE module for Trip/Close operation using up to four-D20 KI interposing relay panels.



Control Outputs, Continued

D25KE DB-25 Raise/Lower Configuration

The 32 digital outputs can be configured as four groups of four Raise/Lower pairs.

Note: The (external) control voltage can be up to 75 Vdc or 50 Vac, at 2 A maximum.

P1 connections for Raise/Lower

Use jumper wires on the Control Function Terminal block to configure:

Group 1:

- connect between +VC (P1-5) and JMP1 (P1-3)

Group 2:

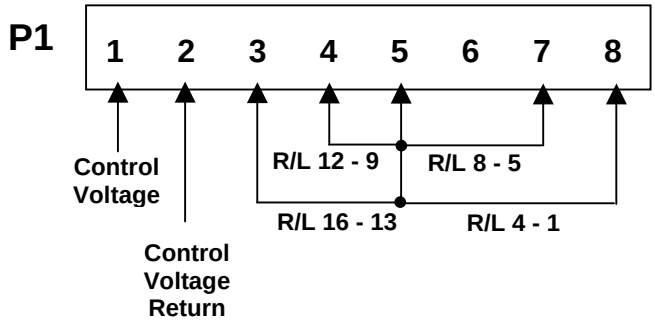
- connect between +VC (P1-5) and JMP2 (P1-4)

Group 3:

- connect between +VC (P1-5) and JMP3 (P1-7)

Group 4:

- connect between +VC (P1-5) and JMP4 (P1-8)



Note

Raise/Lower Digital Outputs are numbered in the reverse order: Lower point **#1** is Digital Output point **#32**

Raise/Lower Connections to Interposing Relay Panels

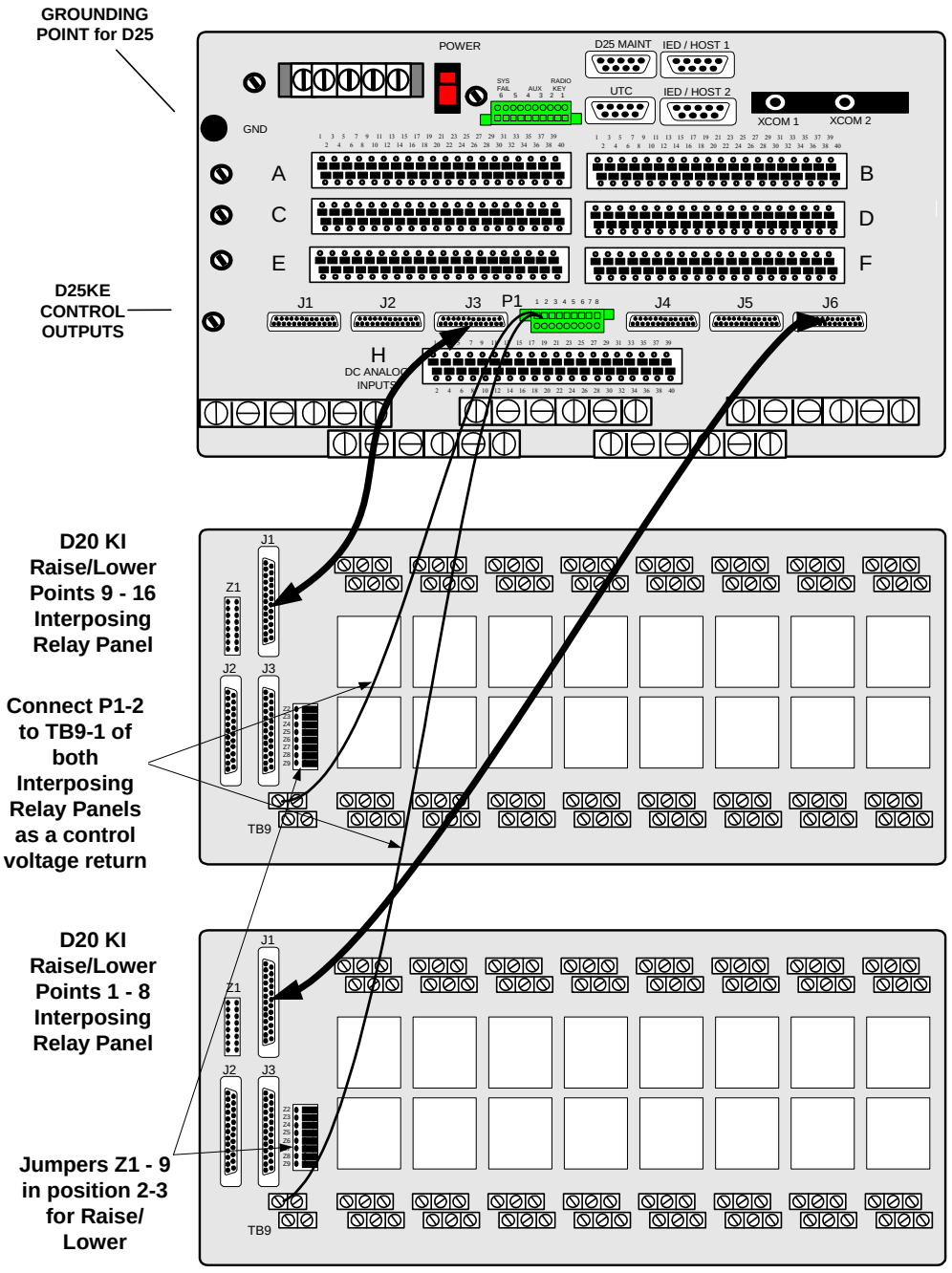
The D25KE module requires two WESTERM KI interposing relay panels to support 16 pairs of Raise/Lower digital outputs. To configure and connect the digital outputs:

- Connect a DB-25 cable from J3 of the D25KE to J1 of the first WESTERM KI interposing relay panel.
- Connect another DB-25 cable from J6 of the D25KE to J1 of the second WESTERM KI interposing relay panel.
- Connect a Control Voltage Return connection from the D25KE's P1-2 to each of the D20 KI's TB9-1
- Set both WESTERM KI's Jumpers Z2 – 9 to 2 - 3

Control Outputs, Continued

D25KE Raiser/Lower Connection Diagram

Shows the connections used when configuring for Raise/Lower operation using two D20 KI interposing relay panels.



Control Outputs, Continued

D25KE DB-25 Combined R/L and T/C

Trip/Close and Raise/Lower digital outputs can be used on the same D25KE DB-25 module.

Note

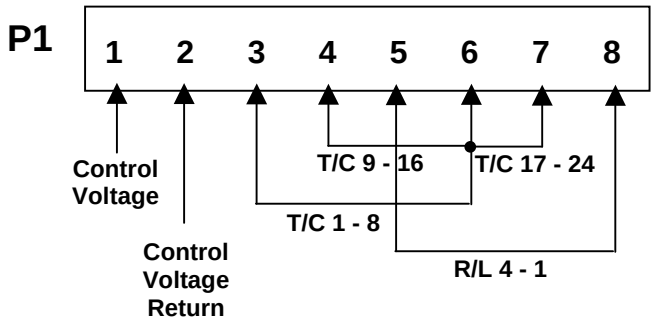
The three examples shown below are the *only* recommended configuration options for combining trip/close and raise/lower in one D25KE.

Do Not configure raise/lower points with point numbers lower than the trip/close point numbers as it may result in wiring problems, and interposing relay connection problems.

Combined T/C and R/L Example #1

In the following example, the first 24 digital outputs are configured as trip/close, and the last 8 are configured as 4 raise/lower pairs.

P1 connections for Combined Raise/Lower and Trip/Close

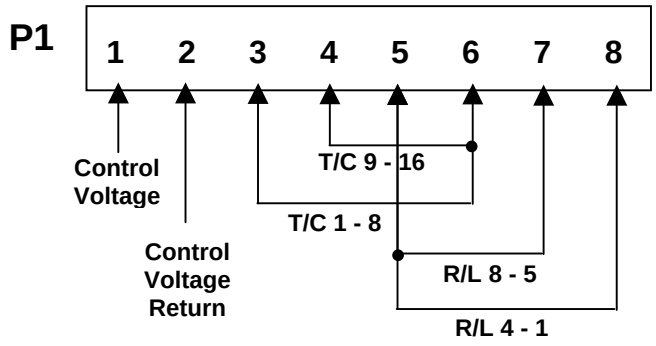


Control Outputs, Continued

Combined T/C and R/L Example #2

This example shows the P1 jumpers when the first 16 digital outputs are configured as trip/close, and the second 16 outputs are configured as 8 raise/lower pairs.

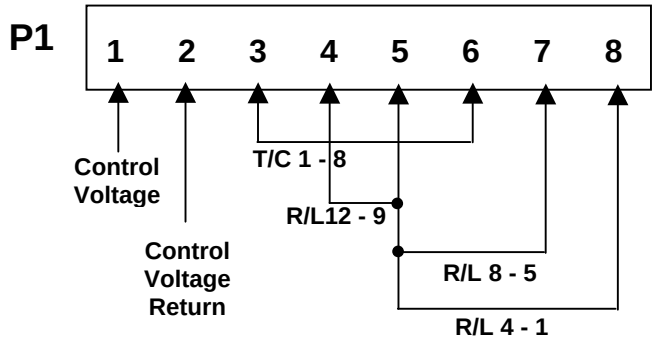
P1 connections for Combined Trip/Close and Raise/Lower



Combined T/C and R/L Example #3

This example shows the P1 jumpers when the first 8 digital outputs are configured as trip/close, and the second 24 outputs are configured as 12 raise/lower pairs.

P1 connections for Combined Trip/Close and Raise/Lower



Control Outputs, Continued

Table: Connector G1 Pinouts

D25KE Digital Output Connections: Pinouts for FACE-40 Connector G1, outputs 1 to 16.

G1 Pin	Signal	G1 Pin	Signal	G1 Pin	Signal
1	COIL_SUP	15	CLS7	29	CLS14
2	COIL_RTN	16	TRP7	30	TRP14
3	CLS1	17	CLS8	31	CLS15
4	TRP1	18	TRP8	32	TRP15
5	CLS2	19	CLS9	33	CLS16
6	TRP2	20	TRP9	34	TRP16
7	CLS3	21	CLS10	35	VCA
8	TRP3	22	TRP10	36	VCA
9	CLS4	23	CLS11	37	JMP1
10	TRP4	24	TRP11	38	JMP2
11	CLS5	25	CLS12	39	MTA
12	TRP5	26	TRP12	40	MTA
13	CLS6	27	CLS13		
14	TRP6	28	TRP13		

Table: Connector G2 Pinouts

Pinouts for FACE-40 Connector G2 outputs 17 to 32.

G2 Pin	Signal	G2 Pin	Signal	G2 Pin	Signal
1	VCB	15	CLS20	29	CLS27
2	VCB	16	TRP20	30	TRP27
3	JMP3	17	CLS21	31	CLS28
4	JMP4	18	TRP21	32	TRP28
5	MTB	19	CLS22	33	CLS29
6	MTB	20	CLS22	34	TRP29
7	MCA	21	CLS23	35	CLS30
8	MCB	22	TRP23	36	TRP30
9	CLS17	23	CLS24	37	CLS31
10	TRP17	24	TRP24	38	TRP31
11	CLS18	25	CLS25	39	CLS32
12	TRP18	26	TRP25	40	TRP32
13	CLS19	27	CLS26		
14	TRP19	28	TRP26		

Control Outputs, Continued

Table: D25KE FACE-40 Board Control Optioning

Specific pins of both FACE-40 Connectors, G1 and G2, are used to configure the D25KE module for trip/close or raise/lower operation: as listed below:

Pin	Signal	Function	Comments
G1 1	COIL_SUP	Control Voltage input	Control Voltage Power Supply connections
G1-2	COIL_SUP_RTN	Control Voltage return	
Control Option Jumpers – Points 1 to 16			
G1-35, G1-36	VCA	R/L Control Voltage for O/P 1-16 (fused)	
G1-37	JMP1	O/P Relays 1-8 mode jumper point	Jumper to Pin G1-35 (VCA) for Raise/Lower Jumper to Pin G1-39 (MTA) for T/C operation
G1-38	JMP2	O/P Relays 9-16 mode jumper point	Jumper to Pin G1-36 (VCA) for Raise/Lower Jumper to Pin G1-40 (MTA) for T/C operation
G1-39, G1-40	MTA	Trip Bus For Channels 1 to 16	
Control Option Jumpers – Points 17 to 32			
G2-1, G2-2	VCB	R/L Control Voltage for O/P 17 to 32 (fused)	
G2-3	JMP3	O/P Relays 17-24 mode jumper point	Jumper to Pin G2-1 (VCB) for Raise/Lower Jumper to Pin G2-5 (MTB) for T/C operation
G2-4	JMP4	O/P Relays 25-32 mode jumper point	Jumper to Pin G2-2 (VCB) for Raise/Lower Jumper to Pin G2-6 (MTB) for T/C operation
G2-5, G2-6	MTB	Trip Bus For Channels 17 to 32	
Master Close Relay Monitoring Points			
G2-7	MCA	Master Close Bus for Channels 1 to 16	*Do not* connect to load or power supply. Use only for monitoring.
G2-8	MCB	Master Close Bus for Channels 17 to 32	*Do not* connect to load or power supply. Use only for monitoring.

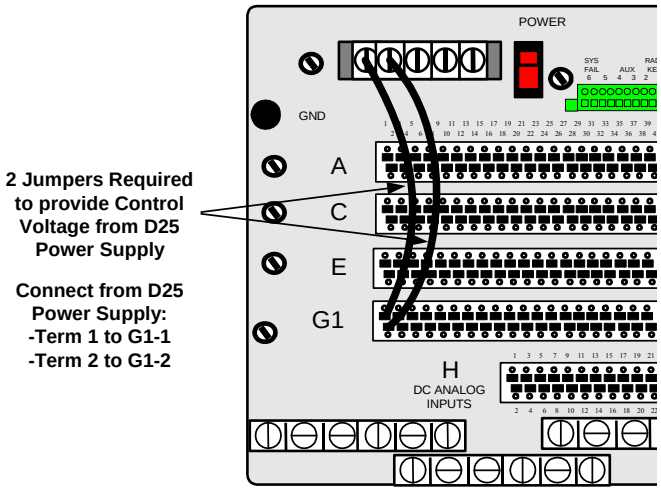
Control Outputs, Continued

D25KE FACE-40 Module Control Voltage Connections

Control voltage can be supplied by either an external power supply, or the D25's own power supply. Connect the control voltage to G1 pins 1 and 2.

Note: The (external) control voltage can be up to 120 Vdc. See page 143 for specifications of control outputs.

To provide control voltage using the D25 internal power supply, connect as shown:



Control Outputs, Continued

D25KE FACE-40 Trip/Close Configuration

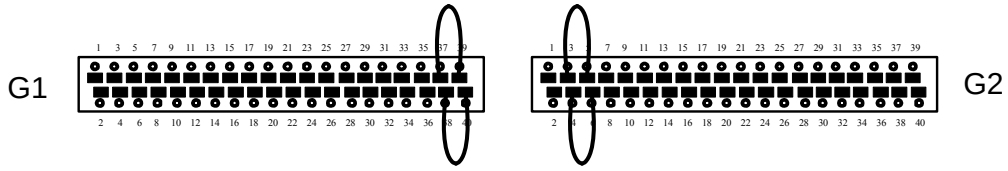
Through the use of "Master" relays, the 32 digital outputs can be configured as four groups of eight Trip/Close pairs: 64 output connections.

Note: The control voltage can be up to 120 Vdc. See page 143 for specifications of control outputs.

G1 and G2 Connections for Trip/Close

Use jumper wires on the FACE-40 terminal block G1 to configure groups 1 and 2.

- Group 1:
  - connect between MTA (G1-39) and JMP1 (G1-37)
- Group 2:
  - connect between MTA (G1-40) and JMP2 (G1-38)



Use jumper wires on the FACE-40 terminal block G2 to configure groups 3 and 4.

- Group 3:
  - connect between MTB (G2-5) and JMP3 (G2-3)
- Group 4:
  - connect between MTB (G2-6) and JMP4 (G2-4)

Control Outputs, Continued

D25KE FACE-40 Raise/Lower Configuration

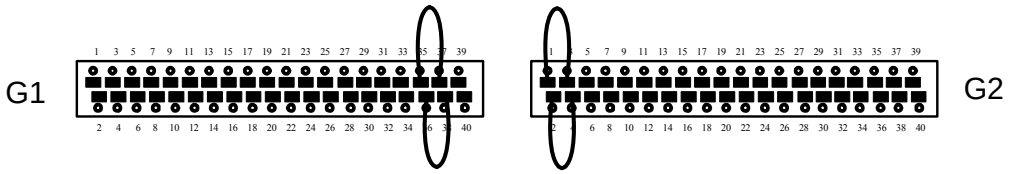
The 32 digital outputs can be configured as four groups of four Raise/Lower pairs.

Note: The control voltage can be up to 120 Vdc. See page 143 for specifications of control outputs.

G1 and G2 Connections for Raise/Lower

Use jumper wires on the FACE-40 terminal block G1 to configure groups 1 and 2.

- Group 1:
  - connect between VCA (G1-35) and JMP1 (G1-37)
- Group 2:
  - connect between VCA (G1-36) and JMP2 (G1-38)



Use jumper wires on the FACE-40 terminal block G2 to configure groups 3 and 4.

- Group 3:
  - connect between VCB (G2-1) and JMP3 (G2-3)
- Group 4:
  - connect between VCB (G2-2) and JMP4 (G2-4)

Control Outputs, Continued

D25KE FACE-40 Combined R/L and T/C

Trip/Close and Raise/Lower digital outputs can be used on the same D25KE FACE-40 unit.

When assigning raise/lower groups, always start with group 4, then group 3, and lastly group 2.

Remember that raise/lower points number in the reverse direction from other point types: point 32 will become lower point 1.

Note

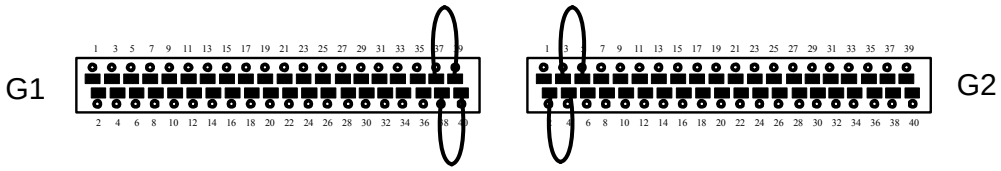
Configuring raise/lower groups with numbers lower than the trip/close group numbers, or between trip/close groups can result in a very complex and confusing wiring scheme.

G1 and G2 Connections for: 3 Groups of Trip/Close, and One Group of Raise/Lower

Jumpering is required to configure a D25KE FACE-40 module for 3 groups of trip/close, and one group of raise/lower:

Use jumper wires on the FACE-40 terminal block G1 to configure groups 1 and 2.

- Group 1:
  - connect between MTA (G1-39) and JMP1 (G1-37)
- Group 2:
  - connect between MTA (G1-40) and JMP2 (G1-38)



Use jumper wires on the FACE-40 terminal block G2 to configure groups 3 and 4.

- Group 3 for trip/close:
  - connect between MTB (G2-5) and JMP3 (G2-3)
- Group 4 for raise/lower:
  - connect between VCB (G2-2) and JMP4 (G2-4)

Control Outputs, Continued

Table: D25KE Configuration Summary
Configuration

Product	Configuration		Jumper position			
			Relays 1-8	Relays 9-16	Relays 17-24	Relays 25-32
	T/C	R/L	JMP1	JMP2	JMP3	JMP4
517-0443 D25KE Control Module FACE40 32 Channel	32	0	G1/37-G1/39	G1/38-G1/40	G2/3-G2/5	G2/4-G2/6
	24	4	G1/37-G1/39	G1/38-G1/40	G2/3-G2/5	G2/2-G2/4
	16	8	G1/37-G1/39	G1/38-G1/40	G2/1-G2/3	G2/2-G2/4
	8	12	G1/37-G1/39	G1/36-G1/38	G2/1-G2/3	G2/2-G2/4
	0	16	G1/35-G1/37	G1/36-G1/38	G2/1-G2/3	G2/2-G2/4
517-0451 D25KE Control Module FACE40 8 Channel	8	0	G1/37-G1/39	N/A	N/A	N/A
	0	4	G1/35-G1/37	N/A	N/A	N/A
517-0452 D25KE Control Module FACE40 16 Channel	16	0	G1/37-G1/39	G1/38-G1/40	N/A	N/A
	8	4	G1/37-G1/39	G1/36-G1/38	N/A	N/A
	0	8	G1/35-G1/37	G1/36-G1/38	N/A	N/A
517-0453 D25KE Control Module FACE40 24 Channel	24	0	G1/37-G1/39	G1/38-G1/40	G2/3-G2/5	N/A
	16	4	G1/37-G1/39	G1/38-G1/40	G2/1-G2/3	N/A
	8	8	G1/37-G1/39	G1/36-G1/38	G2/1-G2/3	N/A
	0	12	G1/35-G1/37	G1/36-G1/38	G2/1-G2/3	N/A
517-0454 D25KE Control Module FACE40 2x8 Channel	2x8	0	G1/37-G1/39	N/A	G2/3-G2/5	N/A
	0	2x4	G1/35-G1/37	N/A	G2/1-G2/3	N/A
517-0455 D25KE Control Module FACE40 2x16 Channel	2x16	0	G1/37-G1/39	G1/38-G1/40	G2/3-G2/5	G2/4-G2/6
	2x8	2x4	G1/37-G1/39	G1/36-G1/38	G2/3-G2/5	G2/2-G2/4
	0	2x8	G1/35-G1/37	G1/36-G1/38	G2/1-G2/3	G2/2-G2/4
517-0447 D25KE Control Module DB25 32 Channel	32	0	P1/3-P1/6	P1/4-P1/6	P1/6-P1/7	P1/6-P1/8
	24	4	P1/3-P1/6	P1/4-P1/6	P1/6-P1/7	P1/5-P1/8
	16	8	P1/3-P1/6	P1/4-P1/6	P1/5-P1/7	P1/5-P1/8
	8	12	P1/3-P1/6	P1/4-P1/5	P1/5-P1/7	P1/5-P1/8
	0	16	P1/3-P1/5	P1/4-P1/5	P1/5-P1/7	P1/5-P1/8
517-0448 D25KE Control Module DB25 8 Channel	8	0	P1/3-P1/6	N/A	N/A	N/A
	0	4	P1/3-P1/5	N/A	N/A	N/A

Control Outputs, Continued

D25KE Configuration Summary Table, continued

Product	Configuration		Jumper position			
			Relays 1-8	Relays 9-16	Relays 17-24	Relays 25-32
	T/C	R/L	JMP1	JMP2	JMP3	JMP4
517-0449 D25KE Control Module DB25 16 Channel	16	0	P1/3-P1/6	P1/4-P1/6	N/A	N/A
	8	4	P1/3-P1/6	P1/4-P1/5	N/A	N/A
	0	8	P1/3-P1/5	P1/4-P1/5	N/A	N/A
517-0450 D25KE Control Module DB25 24 Channel	24	0	P1/3-P1/6	P1/4-P1/6	P1/6-P1/7	N/A
	16	4	P1/3-P1/6	P1/4-P1/6	P1/5-P1/7	N/A
	8	8	P1/3-P1/6	P1/4-P1/5	P1/5-P1/7	N/A
	0	12	P1/3-P1/5	P1/4-P1/5	P1/5-P1/7	N/A

Note: Use GE part number 970-0264 Quad-Wire Jumper or plain wire of appropriate gauge to configure D25KE card.

Control Outputs, Continued

Note : D25HC KE with WESDAC Type III DAC

- The D25 High Current KE module can be used *only* with a D25 using the WESDAC Type III DAC board revision **06A or higher**.
- When seal-in is in effect only a software request or an external current interruption in the respective circuit (e.g. auxiliary breaker contacts) can open the affected relay
- Outputs with connected current supervision must be configured in ConfigPro as well.
- The control outputs are not fused; in order to protect the D25 HCKE Module from overcurrent, you should add an external protection device. GE recommends the use of a maximum 5A, 20-second time delay fuse.
- The current supervision is connected to the appropriate control output channel. The software does not support the use of only the current monitoring input for other purposes.

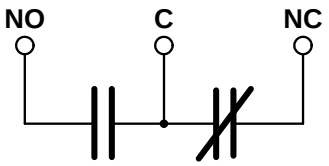
Important!

Warning

The high voltage area of the D25 High Current KE Digital Output Module is in close proximity to the D25 chassis. Ensure that relay contacts are de-energized before removing the D25 HCKE DO Module.

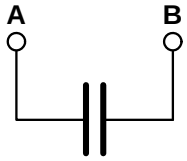
Types of Inputs Implemented on High Current KE Card (HCKE)

- 1 Form C (Control Outputs #1 through #8)



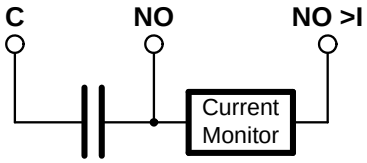
1 Form C

- 1 Form A (Control Outputs #9 through #24)



1 Form A

- 1 Form A with Current Monitoring (Control Outputs #25 through #32)



1 Form A with Current Monitoring Circuit

- When current supervision is required, the load shall be connected between terminals C and NO >I. Otherwise the load should be connected between terminals C and NO of the appropriate channel
- When current supervision is required, the load must be wired to terminal C and NO >I of channels 25 to 32.

Table: Connector G1 & G2 Pinouts on HCKE

D25 High Current KE Digital Output Connections: Pinouts for FACE-40 Connector G1 and G2, outputs 1 to 32.

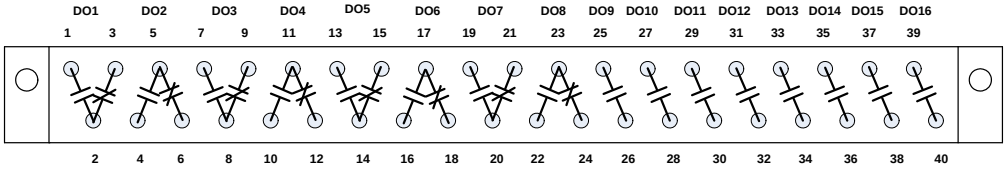
Connector G1			Connector G2		
Pin	**Signal**	**Description**	**Pin**	**Signal**	**Description**
G1-1	1NO	Channel # 1 NO terminal	G2-1	17A	Channel # 17 NO A terminal
G1-2	1C	Channel # 1 Common terminal	G2-2	17B	Channel # 17 NO B terminal
G1-3	1NC	Channel # 1 NC terminal	G2-3	18A	Channel # 18 NO A terminal
G1-4	2NO	Channel # 2 NO terminal	G2-4	18B	Channel # 18 NO B terminal
G1-5	2C	Channel # 2 Common terminal	G2-5	19A	Channel # 19 NO A terminal

Connector G1			Connector G2		
Pin	**Signal**	**Description**	**Pin**	**Signal**	**Description**
G1-6	2NC	Channel # 2 NC terminal	G2-6	19B	Channel # 19 NO B terminal
G1-7	3NO	Channel # 3 NO terminal	G2-7	20A	Channel # 20 NO A terminal
G1-8	3C	Channel # 3 Common terminal	G2-8	20B	Channel # 20 NO B terminal
G1-9	3NC	Channel # 3 NC terminal	G2-9	21A	Channel # 21 NO A terminal
G1-10	4NO	Channel # 4 NO terminal	G2-10	21B	Channel # 21 NO B terminal
G1-11	4C	Channel # 4 Common terminal	G2-11	22A	Channel # 22 NO A terminal
G1-12	4NC	Channel # 4 NC terminal	G2-12	22B	Channel # 22 NO B terminal
G1-13	5NO	Channel # 5 NO terminal	G2-13	23A	Channel # 23 NO A terminal
G1-14	5C	Channel # 5 Common terminal	G2-14	23B	Channel # 23 NO B terminal
G1-15	5NC	Channel # 5 NC terminal	G2-15	24A	Channel # 24 NO A terminal
G1-16	6NO	Channel # 6 NO terminal	G2-16	24B	Channel # 24 NO B terminal
G1-17	6C	Channel # 6 Common terminal	G2-17	25C	Channel # 25 Common terminal
G1-18	6NC	Channel # 6 NC terminal	G2-18	25NO	Channel # 25 NO terminal
G1-19	7NO	Channel # 7 NO terminal	G2-19	25NO >I	Channel # 25 NO Current monitoring terminal
G1-20	7C	Channel # 7 Common terminal	G2-20	26NO >I	Channel # 26 NO Current monitoring terminal
G1-21	7NC	Channel # 7 NC terminal	G2-21	26C	Channel # 26 Common terminal
G1-22	8NO	Channel # 8 NO terminal	G2-22	26NO	Channel # 26 NO terminal
G1-23	8C	Channel # 8 Common terminal	G2-23	27C	Channel # 27 Common terminal
G1-24	8NC	Channel # 8 NC terminal	G2-24	27NO	Channel # 27 NO terminal
G1-25	9A	Channel # 9 NO A terminal	G2-25	27NO >I	Channel # 27 NO Current monitoring terminal
G1-26	9B	Channel # 9 NO B terminal	G2-26	28NO >I	Channel # 28 NO Current monitoring terminal
G1-27	10A	Channel # 10 NO A terminal	G2-27	28C	Channel # 28 Common terminal
G1-28	10B	Channel # 10 NO B terminal	G2-28	28NO	Channel # 28 NO terminal
G1-29	11A	Channel # 11 NO A terminal	G2-29	29C	Channel # 29 Common terminal
G1-30	11B	Channel # 11 NO B terminal	G2-30	29NO	Channel # 29 NO terminal
G1-31	12A	Channel # 12 NO A terminal	G2-31	29NO >I	Channel # 29 NO Current monitoring terminal
G1-32	12B	Channel # 12 NO B terminal	G2-32	30NO >I	Channel # 30 NO Current monitoring terminal
G1-33	13A	Channel # 13 NO A terminal	G2-33	30C	Channel # 30 Common terminal
G1-34	13B	Channel # 13 NO B terminal	G2-34	30NO	Channel # 30 NO terminal
G1-35	14A	Channel # 14 NO A terminal	G2-35	31C	Channel # 31 Common terminal
G1-36	14B	Channel # 14 NO B terminal	G2-36	31NO	Channel # 31 NO terminal
G1-37	15A	Channel # 15 NO A terminal	G2-37	31NO >I	Channel # 31 NO Current

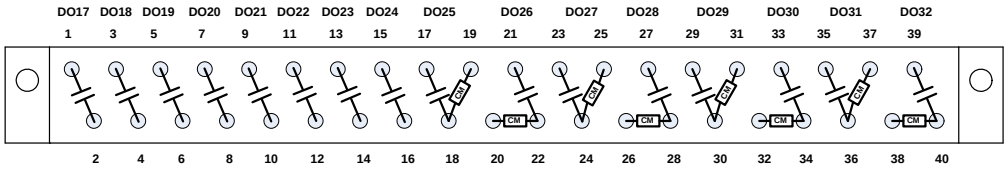
Connector G1			Connector G2		
Pin	**Signal**	**Description**	**Pin**	**Signal**	**Description**
					monitoring terminal
G1-38	15B	Channel # 15 NO B terminal	G2-38	32NO >I	Channel # 32 NO Current monitoring terminal
G1-39	16A	Channel # 16 NO A terminal	G2-39	32C	Channel # 32 Common terminal
G1-40	16B	Channel # 16 NO B terminal	G2-40	32NO	Channel # 32 NO terminal

Figure: Connectors G1 & G2 Pinouts Layout

Connector G1



Connector G2



DC Analog Inputs

DC Analog Inputs

- All DC Analog Card options are available with 16 inputs.
- The inputs may be voltage or current.
- With the exception of the 517-0478 and 517-0479 cards that use adapter modules, there are no on-board option jumpers; each option requires a different card.

Shielding

All inputs should have shield connected at source of signal. Shields can alternately be connected to the auxiliary ground on D25 power supply terminal block. *DO NOT* ground at both ends of cable.

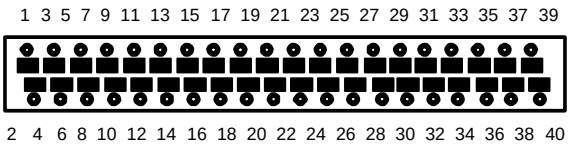
Table: Digital Counts

Table of typical digital counts stored in the D25 System Point Database representing inputs at several input levels, and scaling settings, for each DC Analog board option:

		10%	25%	50%	75%	Nom	120%
Input Option	+/- 5V	.5V	1.25V	2.5V	3.75V	5V	6V
	+/- 1 mA	.1 mA	.25 mA	.5 mA	.75 mA	1 mA	1.2 mA
	+/- 5 mA	.5 mA	1.25 mA	2.5 mA	3.75 mA	5 mA	6 mA
	+/- 10 mA	1 mA	2.5 mA	5 mA	7.5 mA	10 mA	12 mA
	+/- 20 mA	2 mA	4 mA	10 mA	15 mA	20 mA	24 mA
Displayed Digital Count	@ 83.333% Scaling	2731	6826	13653	20479	27306	32767
	@ 100% Scaling	3277	8192	16383	24575	32767	>32767
	@ 200% Scaling	6553	16383	32767	>32767	>32767	>32767

DC Analog Inputs, Continued

Table: DC Analog Input Connector Pinout



Location of adapters on the module's PCB for each input:

Connector H Pin #	SIGNAL	Connector H Pin #	SIGNAL	Input Adapter Location
1	Ain 1+	2	Ain 1-	M1
3	Ain 2+	4	Ain 2-	M2
5	Ain 3+	6	Ain 3-	M3
7	Ain 4+	8	Ain 4-	M4
9	Ain 5+	10	Ain 5-	M5
11	Ain 6+	12	Ain 6-	M6
13	Ain 7+	14	Ain 7-	M7
15	Ain 8+	16	Ain 8-	M8
17	N/C	18	N/C	
19	N/C	20	N/C	
21	N/C	22	N/C	
23	N/C	24	N/C	
25	Ain 9+	26	Ain 9-	M9
27	Ain 10+	28	Ain 10-	M10
29	Ain 11+	30	Ain 11-	M11
31	Ain 12+	32	Ain 12-	M12
33	Ain 13+	34	Ain 13-	M13
35	Ain 14+	36	Ain 14-	M14
37	Ain 15+	38	Ain 15-	M15
39	Ain 16+	40	Ain 16-	M16

AC Analog Inputs

AC Analog Inputs

The D25 accepts up to 15 AC analog inputs, which are grouped into five sets of three each.

The D25 can support virtually any combination of CTs and PTs.

The only restrictions are:

- TB1 inputs *must* be PTs
- Each group of 3 transformers *must* be of the same type

If no AC inputs are specified, AC Input configuration is disabled.

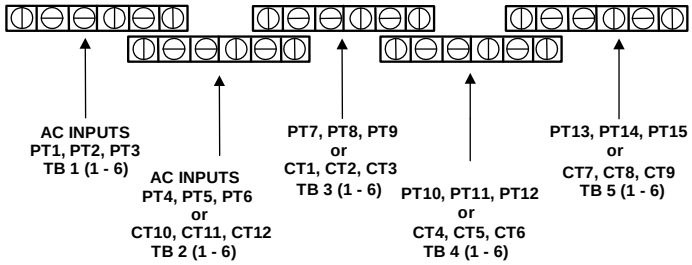
Disabled parameters appear in dark green in the ConfigPro I/O Configuration window

AC Analog Circuit Mapping

A flexible AC input mapping feature, called **E-Z Map,** is included.

- It allows you to configure, for each input of an AC circuit, the physical AC input that supplies the required signal.
- It gives you complete flexibility in wiring the AC inputs and assigning them to the appropriate circuit inputs.

AC Analog Physical Input Connections



AC Analog Inputs, Continued

Table: Input Connections TB1, TB2, TB3, TB4 and TB5 connections.

TB 1	Signal
1	PT1A
2	PT1B
3	PT2A
4	PT2B
5	PT3A
6	PT3B

TB 3	Signal
1	PT7A/CT1A
2	PT7B/CT1B
3	PT8A/CT2A
4	PT8B/CT2B
5	PT9A/CT3A
6	PT9B/CT3B

TB 5	Signal
1	PT13A/CT7A
2	PT13B/CT7B
3	PT14A/CT8A
4	PT14B/CT8B
5	PT15A/CT9A
6	PT15B/CT9B

TB 2	Signal
1	PT4A/CT10A
2	PT4B/CT10B
3	PT5A/CT11A
4	PT5B/CT11B
5	PT6A/CT12A
6	PT6B/CT12B

TB 4	Signal
1	PT10A/CT4A
2	PT10B/CT4B
3	PT11A/CT5A
4	PT11B/CT5B
5	PT12A/CT6A
6	PT12B/CT6B

Caution!

Use extreme caution when connecting field wiring to the AC inputs.
A D25 can have a wide variety of input options, and there are no obvious indications on the rear of the D25 enclosure to identify the type of inputs installed.
Connecting a CT to a voltage input (or vice versa) may cause equipment damage and/or severe injury

Communications Ports

Serial and LAN Options The D25 is very configurable for communications, offering serial and LAN interface options.

WESMAINT Connector The WESMAINT II+ connector on the front panel provides a serial interface to access the WESMAINT II+ maintenance facility.

Using WESMAINT you can:

- perform local maintenance and diagnostic functionality
- download configuration data from the PC-based ConfigPro software
- upload diagnostic and operational information from the D25

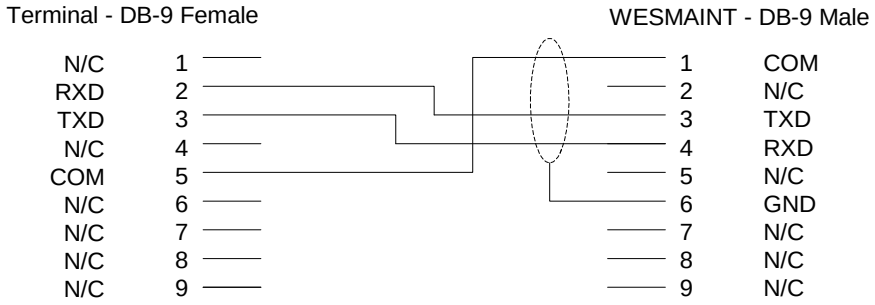
WESMAINT II+ serial interface supports RS-232 signaling, and operates at a fixed rate of 9600 bps.

Communications Ports, Continued

Serial WESMAINT Cable

To connect a PC to the D25, use a WESMAINT II+ cable (GE part number 977-0048/96), or equivalent. Attach the 9-pin female jack of the WESMAINT II+ cable to the D25, and the other end of the WESMAINT II+ cable to a PC,

Schematic for this cable:



COM1

D25 MAINT Display Port

The DB-9-F D25 MAINT display interface option provides a local port for optional display devices.

This port located on the back panel provides:

- fixed communication parameters
- RS-485 interface
- 2-wire or 4-wire interface, selected using ConfigPro
  - a 2-wire cable is required for 2-wire operation, see cable schematic below.

Communications Ports, Continued

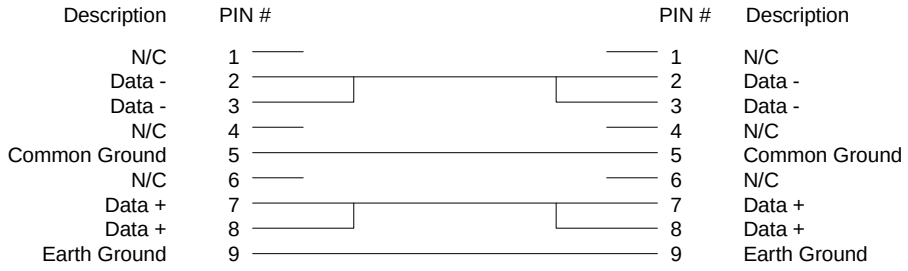
Table: D25 MAINT Port Pinout

Pinout of the D25 MAINT DB-9 connector.

DB-9 Pin	RS-485
1	N/C
2	RX-
3	TX-
4	N/C
5	Com GND
6	N/C
7	TX+
8	RX+
9	EARTH GND

2-Wire RS-485 Cable

Schematic of the cable wiring necessary for 2-Wire RS-485 connection.


Description
PIN #
PIN #
Description
N/C 1 1 N/C
Data - 2 2 Data -
Data - 3 3 Data -
N/C 4 4 N/C
Common Ground 5 5 Common Ground
N/C 6 6 N/C
Data + 7 7 Data +
Data + 8 8 Data +
Earth Ground 9 9 Earth Ground

COM2

Universal Time Code (UTC) Port

The Universal Time Code (UTC) port located on the back panel provides a connection to a satellite time-code receiver, or equivalent.

- The DB-9-F UTC port can be selected for *receive-only* RS-232 or RS-422 interface, using ConfigPro.
- Supported UTC Port protocols are IRIG-B and Rugby
- Communication parameters are determined by the protocol application.

Note

Many IRIG-B receivers are available with modulated and/or unmodulated output options.

- IRIG-B is received on CTS port.
- The input to the UTC port must be unmodulated.
- If the unmodulated output of the receiver is a coaxial connection, a converter will be required to interface the D25.

Communications Ports, Continued

Table: UTC Port Pinout

How to connect to the UTC Port DB-9 connector for either RS-232 or RS-422 interface.

Note: Pins 7 and 8 are tied together internally.

DB-9 Pin	RS-422 Signal	RS-232 Signal
1	T_RX+	N/C
2	T_RX-	RX
3	N/C	N/C
4	N/C	N/C
5	COM GND	COM GND
6	CLKE+	N/C
7	CLKE-	N/C
8	N/C	CTS
9	EARTH GND	EARTH GND

COM3 and COM4

IED1 and IED2 Serial Ports

Two general-purpose, on-board communication ports are available on the back panel of the D25, and use female DB-9-F style connectors. The IED ports provide:

- Variable communication parameters
- Optional software flow control
- Optional hardware flow control
- Out-of-sequence transmission of one byte of data
- Support for several I/O timers

Transmission of break characters

Both IED ports RS-232 and RS-485 (for multi-drop applications) are supported on the same physical connector.

Note:, The input resistance 12 KΩ is used for all serial ports in D25 (UTC/IED/XCOM) when configured as RS485. The typical resistance is 24 KΩ, but use 12 KΩ as maximum burden. This is very important for daisy chaining D25s, especially for IRIG-B signals.

IED Serial Ports Options

The COM3 and COM4 serial ports are programmed via ConfigPro for:

- RS-232 or RS-485 selection
- RS-485 2-Wire / 4-Wire selection

Note: The 2 to 4- Wire selection in ConfigPro's **Device Properties** *only* affects the internal software control (handshaking) of the interface. It *does not* change the physical characteristics of the communication ports.

Communications Ports, Continued

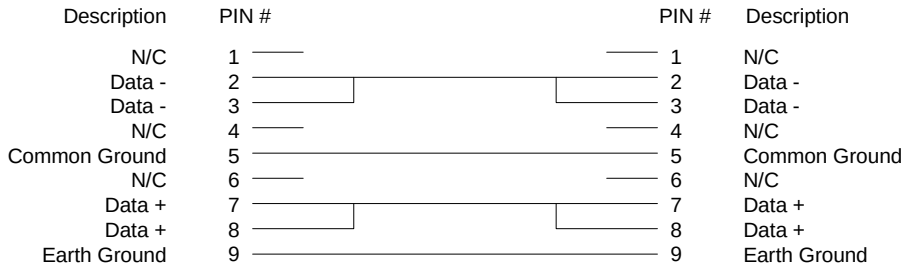
Table: Serial Port Pinouts

Pinouts for COM3 and COM4 serial ports for both RS-232 to RS-485 configurations:

DB-9 Pin	RS-232	RS-485
1	CD	N/C
2	RX	RX-
3	TX	TX-
4	N/C	N/C
5	GND	Com GND
6	N/C	N/C
7	RTS	TX+
8	CTS	RX+
9	EARTH GND	EARTH GND

2-Wire RS-485 Cable

Schematic of the cable wiring necessary for 2-Wire RS-485 operation.


Description
PIN #
PIN #
Description
N/C 1 1 N/C
Data - 2 2 Data -
Data - 3 3 Data -
N/C 4 4 N/C
Common Ground 5 5 Common Ground
N/C 6 6 N/C
Data + 7 7 Data +
Data + 8 8 Data +
Earth Ground 9 9 Earth Ground

Communications Ports, Continued

Configuring RS-485 2-Wire

In RS-485 two-wire mode, the RTS line internal to the D25 controls the transmitter (the RTS signal is not propagated on to the serial cable, but is present inside the hardware).

While RTS is active, the transceiver is in transmit mode. The "preamble" and "postamble" timers determine the delay prior to transmission, and the amount of time following transmission that the transmitter remains in control of the RS-485 line.

When the RTS line drops, the RS-485 port is placed back in receive mode until the next time the D25 requests a transmission.

There is a third timer used to configure the amount of time the receiver must be idle before the transmitter can be engaged. Although this timer is configurable, most software applications do not have this timer in their configurations, and thus it is left at its default value.

Control Signal Digital Outputs

There are three digital outputs available through the Auxiliary Controls connector:

- System fail output
- Radio keying output
- Auxiliary control output

The contacts of the relays provide electrical and mechanical isolation for all three signals.

System Fail Output

System Fail Output provides:

- Form B (N/C) contact output with a rating of 60 W
- Maximum current: 2 A
- Maximum voltage across the output: 75 V_{DC}, or 50 V_{AC}
- Contact wetting must be supplied from a source external to the D25

This output will be activated during the Power On Self Test (POST) that runs whenever the D25 is reset via software or through cycling of power.

Radio Keying Output

Radio Keying Output provides:

- Form A (N/O) contact output with a 60 W rating
- Maximum current through the contacts: 2 A
- Maximum voltage across the output: 75 V_{DC}, or 50 V_{AC}
- Contact wetting must be supplied from a source external to the D25

Radio Keying Output emulates "push-to-talk" whenever the D25 is configured to use radio communications equipment that requires this feature.

Communications Ports, Continued

Radio Keying Operation

If enabled by configuring jumper JP1 on the IED/UTC card, the Radio Keying Output activates whenever the RTS line of XCOM1 is asserted.

Refer to *Configuring Radio Keying Option* on Page 114 for details.

Auxiliary Digital Output

Auxiliary Digital Output can be used for control functions when use of a standard digital output is not practical.

The digital output under software control provides:

- Form A (N/O) contact output with a rating: 60 W
- Maximum current through the contacts: 2 A
- Maximum voltage across the output: 75 V_{DC}, or 50 V_{AC}
- Contact wetting must be supplied from a source external to the D25

Note

When operating the Auxiliary Digital Output using WESMAINT, Only **On** or **Off** (latch) commands are supported.

Attempting any other mode of operation will result in an error code being displayed.

Serial XCOM Interfaces

If an Ethernet or a Serial XCOM external communication module is installed in the D25, the XCOM interfaces are designated COM5 and COM6, respectively.

Serial XCOM Connection

The Serial XCOM (part numbers 580-0991 and special order 580-0933) cards have two DB-9-F interfaces, labeled XCOM1 and XCOM2.

They both have these characteristics:

- External power connection
- Programmed via ConfigPro for:
  - RS-232 or RS-485
  - RS-485 2-Wire or 4-Wire

Note: The 2 to 4-Wire wire selection in ConfigPro's Device Properties *only* affects the internal software control (handshaking) of the interface. It *does not* change the physical characteristics of the ports.

Communications Ports, Continued

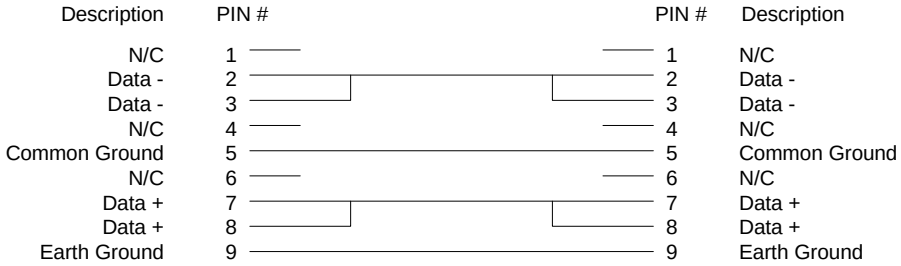
Table: Serial XCOM Port Pinouts

Pinouts for COM5 and COM6 serial ports for both RS-232 and RS-485 configurations:

DB-9 Pin	RS-232	RS-485
1	CD	N/C
2	RX	RX-
3	TX	TX-
4	(+12V)	(+12V)
5	GND	Com GND
6	(-12V)	(-12V)
7	RTS	TX+
8	CTS	RX+
9	EARTH GND	EARTH GND

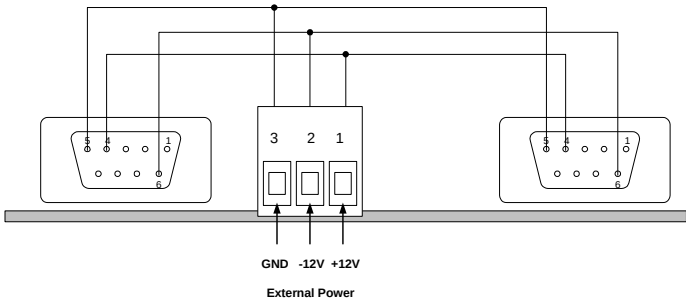
2-Wire RS-485 Cable

Schematic for the cable wiring necessary for 2-Wire RS-485 operation.


Description
PIN #
PIN #
Description
N/C 1 1 N/C
Data - 2 2 Data -
Data - 3 3 Data -
N/C 4 4 N/C
Common Ground 5 5 Common Ground
N/C 6 6 N/C
Data + 7 7 Data +
Data + 8 8 Data +
Earth Ground 9 9 Earth Ground

External ±12 Volt Supply

The XCOM card part number 580-0931 is equipped with a 3-pin terminal (Phoenix) block, where the power for modems attached to the DB-9 connectors can be externally supplied.



Note

The power connections are labeled ±12 V, and can be used to provide a variety of AC or DC voltages.

Use care not to exceed connector or cable specifications.

Communications Ports, Continued

Caution

580-0933 Special Order Only

The 580-0933 type of serial XCOM is available *only* through special order.

It provides power for external communication devices, such as modems, from the D25 internal power supply. This violates the isolation specifications of the card, and can lead to two problems, if not accounted for:

- an external surge of voltage, such as a lightning strike, can be passed from a modem into the D25 internal circuitry where damage may occur
- inadvertent connection of power to the card's external 3-pin terminal block may cause damage to the D25 power system

---

Difference Between IED and Serial XCOM Ports

The XCOM ports provide the same functionality as the IED Ports, with this difference:

- XCOM ports run at a lower priority than the IED ports. It is therefore most efficient to put the heaviest communication on the XCOM ports.

Note

If you place the heaviest traffic on the IED ports, the higher priority IED ports will often delay servicing of the XCOM ports.

Constant high-volume traffic on the IED ports can cause the XCOM ports to lose data. By placing the lower traffic connections on the IED ports, you ensure that XCOM ports always get serviced in a timely manner. Heavier traffic on the XCOM ports will be interrupted only momentarily (and within the buffering ability of the XCOM card) by small bursts on the higher priority IED ports.

Connecting Ethernet XCOM Interfaces

Three variations of Ethernet / 802.3 XCOM cards are available:

- 10BASE2 (obsolete and available as Special Order – see Product Bulletin PRBT-0252)
- 10BASE-T
- 10BASE-FL

All have dual interfaces, labeled XCOM1 and XCOM2.

Refer to page 115 for information about jumper options.

10BASE2 Card Connections & Indicators

- Cable: "Thin" Coax RG-58
- Connection is BNC-type.
- First and last units on coaxial cable need 50Ω termination

Note: The 10BASE2 XCOM card has no LED indicators on its back panel.

This option is obsolete and available as Special Order – see Product Bulletin PRBT-0252)

Communications Ports, Continued

10BASE-T Card Connections & Indicators

- Unshielded Twisted-Pair (UTP) wire
- RJ-type connectors used
- Either a point-to-point or star network topology using multi-port repeater, or Hub.

The 10BASE-T module has six LEDs on the back panel.

LED	Function	Comments
RCV	Transceiver is receiving	Turns on when connection is made, indicating receiver is unsquelched. Blinks when traffic is received.
XMT	Transceiver is transmitting	Flashes only when transmitting
JAB	Network Jabber status	Normally off. Transmitter is disabled when on.
CLS	Collision is taking place on network	Indicates a JAM signal is being broadcast on LAN.
POL	Receive Polarity	Off when receive polarity is correct.
LTF	Link Test Fail	Low signal level received. Both the transmitter and receiver are disabled.

10BASE-FL Card Connections & Indicators

- Fiber-optic media
- ST-type connectors.

The 10BASE-FL module has six LEDs on the back panel.

LED	Function	Comments
RCV	Transceiver is receiving	Blinks when traffic is received
XMT	Transceiver is transmitting	Flashes only when transmitting
PWR	Power is applied	Normally on
JAB	Network Jabber status	Transmitter is disabled when on
CLS	Collision is taking place on network	Indicates a JAM signal is being broadcast on LAN
LMO	Link Monitor	Indicates low light level received

Chapter 4: Powering-up and Testing

Power-up and test the D25

Once you have completed all field wiring and communication connections and the necessary hardware configuration, the next step is to power-up the D25 and verify that it is functioning properly.

Use this section of the guide to prepare for powering-up and learn how to correctly perform the power-up and other tests:

- What is needed to test: WESMAINT II+, 68K Monitor and ConfigPro
- How to power-up the D25 and conduct the BOOT Test: Power On Self-Test
- Digital Input Verification Test
- Digital Output Verification Test
- DC Analog Input Test
- AC Voltage and Current Input Test

If power-up and test reveals that the D25 is not functioning properly due to software malfunction and you need to download code and configuration files to the FLASH memory, see D25 Software.

Note

Before any of the tests and procedures in this section can be performed, a valid configuration file must be loaded into the D25's NVRAM.

If you have replaced the main board of the D25, then you need to restore the configuration file so that verification tests can be performed.

If you need help restoring your configuration file, refer to the *ConfigPro* On Line Help.

Testing Utilities

Testing Utilities

The following utilities are used to configure and test the D25:

- WESMAINT II+
- 68K Monitor
- ConfigPro Configuration system

There is some functional overlap between these components.

WESMAINT II+

Each *operational* D25 unit includes a WESMAINT II+ facility that allows you to go on-line with the D25 to examine the database, applications and communications, and to manipulate the data.

For example, the state of a digital input data can be examined, or a digital output forced on or off.

Testing Utilities, Continued

Accessing WESMAINT II+ Using a Terminal

You can use a VT100-compatible terminal or a terminal emulation program to directly access the WESMAINT II+ facility. Examples of suitable terminal emulation programs are:

- The third party terminal emulation software included on the ConfigPro CD
- The ConfigPro configuration system's Terminal Emulator

If your PC (or similar platform) has a TELNET terminal emulation software package, it can be used to connect to the D25 through an Ethernet network link.

Note: For further information about using WESMAINT II+ software to perform any of the test procedures in this section, refer to the *WESMAINT II+ User's Guide*.

Note

Microsoft® Windows® **HyperTerminal** can be used for terminal emulation but it is NOT recommended because code and configuration file download time is considerably increased.

68K Monitor

The 68K Monitor is a debugging and diagnostics tool that is accessible in two ways:

- As a menu selection in WESMAINT II+.
- Upon start-up of a D25 that has not been previously configured.

Note: For further information about using the 68K Monitor, refer to the *68K Monitor User's Guide*.

ConfigPro

The ConfigPro Configuration System is used to define the operational parameters of the D25. ConfigPro can be used to download configuration files to the D25 through a serial connection, or through the optional Ethernet TELNET connection available to Windows users.

Note: For further information about ConfigPro, refer to the ConfigPro On Line Help.

Boot Up

Procedure: BOOT Test: Power On Self Test (POST)

The software installed at the factory includes a Power On Self-Test (POST) process. This test, which you can initiate before the D25 is installed or connected remotely, verifies that all circuitry is responding and all internal connections are firmly in place.

You may need to do this after maintenance work has been carried out, such as a board replacement or upgrade.

Steps to verify the POST process:

Step	Action
1	Move the **CONTROLS** switch on the front panel of the D25 to the **REMOTE** position.
2	Verify that power cable is properly connected to the D25, and the proper power is available. See Power Supply for power connection details.
3	Locate the power switch on the back of the D25, and toggle it to the ON position. Results: The **POWER** indicator, a green LED on the front panel lights when power to the D25 is turned on.

System Diagnostics

The D25 automatically boots, conducting a series of self-diagnostic tests as soon as the power is turned on.

Note: If the D25 fails to function, it might have sustained internal damage during shipping. Contact GE Energy for assistance.

Note

The **LOCAL** LED, **POWER** LED and **RUN** LED all light up during the self-diagnostic sequence.

See Front Panel Indicators for more information on LEDs on startup.

Diagnostics Completed

Self-diagnostic testing is complete when:

- The Software Application list appears on the PC monitor, if connected
- If a control card is installed, the **REMOTE** indicator LED lights up, and the **LOCAL** LED turns off.

Using WESMAINT

On-Line Start-up Test

When the D25 is powered-up or restarted, internal processes perform a series of routines, starting with self-tests, followed by the spawning of all the software applications that reside in the unit's memory.

Many of these processes will output progress messages to the 68K monitor, as they are performed. Having a terminal set up to view these start-up messages can provide useful information about the operational status of the unit.

Note

Terminal emulation software is not part of the D25 system, but terminal software, such as ConfigPro's Terminal Emulator, can be used for viewing system messages.

For complete instructions about using the emulation software in your stand-alone PC or laptop, refer to the documentation provided with the software.

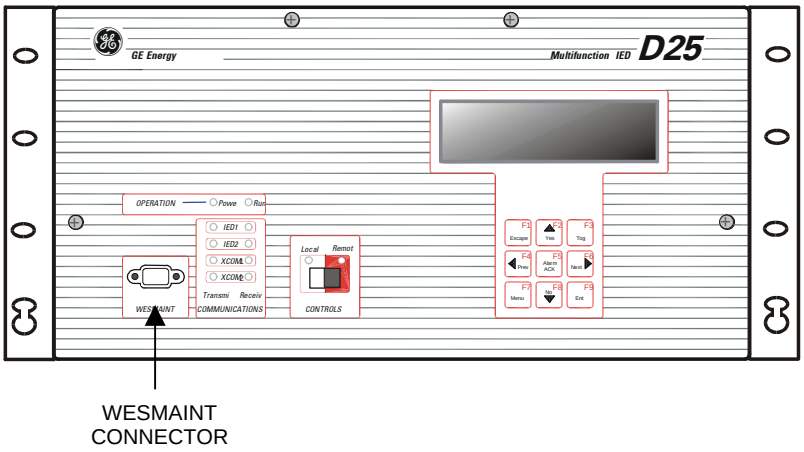
Procedure: Setup Terminal for WESMAINT

Steps to setup a PC to act as a WESMAINT II+ terminal.

Step	Action
1	Open the VT100 compatible terminal emulation software you are going to use.
2	Verify (or set) terminal communications settings as follows: • Data Rate — 9600 bps • Data Bits — 8 • Stop Bits — 1 • Parity — None • Flow Control — Xon/Xoff (software) • Connector settings — (COM1, COM2) as required by the computer being used Results: Your terminal emulator settings are now configured.

Using WESMAINT, Continued

Procedure: Connect to the WESMAINT



Step	Action
1	Connect a WESMAINT II+ cable to the female DB-9 WESMAINT II+ port on the front panel of the D25.
2	Attach the other end of the WESMAINT II+ cable to the selected serial communications port of the PC or terminal.
D25 Hardware Setup	
3	Move the **CONTROLS** switch on the front panel of the D25 to the **REMOTE** position.
4	Verify that power cable is properly connected to the D25, and the proper power is available. See Power Supply above.
5	Locate the power switch on the back of the D25, and toggle it to the ON position. Results: The **POWER** indicator, a green LED on the front panel lights when power to the D25 is turned on.
6	Monitor the terminal display. Results: A series of text scripts display as the POST routines are performed. If the text does not display, check connections and repeat this procedure.

Note

The D25 automatically boots as soon as the power is turned on.
If the D25 fails to function, it might have sustained internal damage during shipping. Contact GE Energy for assistance.

Testing Hardware I/O Points

Testing Hardware I/O Points

To test I/O points:

- Login to WESMAINT
- Navigate to the specific WESMAINT display for the type of points you want to test
- Follow the instructions given below for testing specific types of points

Data Points

The Plant I/O software application version in the D25's firmware determines the quantity and relative position of data points in the System Point Database

The actual point number that you want to test can be determined by:

- Viewing the point descriptions that are displayed in WESMAINT
- Referring to the ConfigPro configuration tables for this specific D25.

Note: Actual point descriptions displayed in WESMAINT depend on changes made to the point descriptions in the running configuration file.

Procedure: Login to WESMAINT

When the POST is complete, login to WESMAINT to test I/O points.

Step	Action
1	Press **ENTER** on the PC keyboard Results: The *Welcome* screen appears, including a Login prompt. Note: If the *Welcome* banner does *not* appear, and only a *<D25S* prompt is displayed, a valid code and/or configuration file is not loaded into the D25's memory. Stop this procedure and review procedures for restoring files: see D25 Software.
2	Type the User Name: *westronic* and Press ENTER. (*)
3	Type the Password: *rd* and Press ENTER. (*) Results: The WESMAINT II+ **Main Menu** appears.
4	If a time-out occurs, press **ENTER** again, to return to **login** prompt.

WESMAINT Tips

- User name and password shown are factory defaults. If you cannot log in, contact your system administrator to obtain new user name and password.
- To select an option from the menus, use the up and down arrow keys to highlight and item and press ENTER, or type the menu item number.
- Press CTRL+L at any time to log out of WESMAINT II+.
- For further information, see the *WESMAINT II+ User's Guide*

Testing Hardware I/O Points, Continued

Digital Input Verification Test

Testing Digital Inputs: Digital input changes are displayed in WESMAINT.

Procedure: Verify Digital Input

To conduct this test the code and configuration file must be downloaded to the D25's FLASH memory.

Note: The following procedure assumes that the digital inputs for the D25 are configured to use *supplied* wetting. Refer to page 26 for configuration information.

From the WESMAINT II+ **Main Menu**:

Step	Action
1	On the **Main Menu**, type **1** — **System Data Display**. Results: The **System Data Menu** appears.
2	On the **System Data Menu**, type **1** — **Digital Input Display**. Results: The point numbers and (optionally) point descriptions appear on the WESMAINT II+ display.
3	Use the arrow keys to move up or down to highlight the desired point number.
4	Use a wire jumper to short out the desired input point, and verify that WESMAINT shows that the point status has changed to On.
5	Go back to Step 3 and repeat the test as necessary to test other available digital points.

Navigating through screens

- Press N to move to the Next page.
- Press P to move to the Previous page.
- Press ESC to back up to the previous menu level.

Testing Hardware I/O Points, Continued

Digital Output Verification Test

Testing Digital Outputs: You can force digital outputs from WESMAINT.

Caution!

Use caution when testing digital output points that are connected to external equipment.

This test may damage external devices, such as relays or reclosers, and may injure personnel.

Procedure: Verify Digital Output

To conduct this test the code and configuration file must be downloaded to the D25's FLASH memory.

From the WESMAINT II+ **Main Menu**:

Step	Action
1	On the **Main Menu**, type **1** — **System Data Display**. Results: The **System Data Menu** appears.
2	On the **System Data Menu**, type **2** — **Digital Output Display**. Results: The point numbers and (optionally) point descriptions appear on the WESMAINT II+ display.
3	Use the arrow keys to move up or down to highlight the desired point number. Results: The cursor should now be flashing on the specified point number.
4	Press CTRL+F when you are ready to force-change the state of the digital output point.
Extra Security	
5	At the **Password** prompt, type ***control*** (*) and press ENTER. Results: The **Digital Output Force Display** appears.
6	Press CTRL+U to change (update) the relay state.

Testing Hardware I/O Points, Continued

Procedure: Verify Digital Output (continued)

Step	Action
7	Press the SPACE BAR to select **Pulse** and press ENTER
8	In the **Off time** field, type **500** and press ENTER
9	In the **On time** field, type **500** and press ENTER
10	In the **Repeat Command** field, type **10** and press ENTER twice Results: Listen carefully for an audible click of the point relay. The test is considered successful if the relays click when forced.

Notes

- The number of times that a control will operate is N+1, where N is the number of repeats entered in the **Repeat command** field

Examples: For a single operation (i.e., no repeats) type *0*;
for two operations, type *1*

Test Failure

No error message appears in WESMAINT if the test fails. If relays do not operate:

1. Ensure that the **CONTROLS** switch is in the **REMOTE** position.
2. Reboot the D25, and repeat the procedure.
3. Call GE Energy for assistance.

Repeat Test

To repeat the test sequence, press CTRL+U. Press ENTER.

Values entered for the previous test are retained until you exit the menu.

Test Next Point

To test another point, use the up or down arrow keys to cycle through points, then press CTRL+U to repeat test.

Note

The same test procedure can be applied when testing the Aux. Output.

Testing Hardware I/O Points, Continued

DC Analog Input Test

Testing DC Analog Inputs: the first part of this test verifies that the internal Analog References are operating within the nominal range.

Analog Input changes are displayed in WESMAINT.

Procedure: Verify Analog Input

To conduct this test the code and configuration file must be downloaded to the D25's FLASH memory.

First, check the Analog Reference values. From the WESMAINT Main Menu:

Step	Action
1	On the **Main Menu**, type **1 — System Data Display**. Results: The **System Data Menu** appears.
2	On the **System Data Menu**, use the up and down arrow keys, or type the menu number **3**, to select **Analog Input Display**, then press ENTER. Results: The point numbers and (optionally) point descriptions appear on the WESMAINT II+ display.
3	Use the arrow keys to move up or down to highlight a D25 Plant I/O Analog Reference point.
4	Verify that the points display a value close to the values shown in this table:

Table: Analog Reference Values

Use this table to verify the DC analog reference values.

Description	Nominal Value
Positive DC Analog Reference	4095 (+/- 230)
Negative DC Analog Reference	-4095 (+/- 230)
Zero DC Analog Reference	0 (+/- 164)

Notes

- These reference values are monitored by D25 software.
- When the D25 software detects an invalid DC analog reference, it sets the value of the field DC analog points to zero and sets the over-range attribute on those points.

Testing Hardware I/O Points, Continued

Procedure: Verify Analog Input (cont'd)

On the Analog Input Display:

Step	Action
5	Press CTRL+G and type the number of the first input point (if known), or use the up and down arrow keys to scroll to the desired analog input point.
6	Connect one end of testing leads to a calibrated voltage or current source.
7	Connect the other end of the leads to the first analog input point on the DC analog input termination.
8	Using the following table as a reference, adjust input voltage or current to these levels: • 0% of full scale • 5% of full scale • 95% of full scale
9	Verify that the values displayed in WESMAINT fall near the values shown in the following table.
10	Go back to Step 5 and repeat as desired for other points on the DC analog input termination.

Table: DC Analog Input Values

Use this table to verify the DC analog input values.

DC Input Option	0% FS	Nominal Displayed Count	5% FS	Nominal Displayed Count	95% FS	Nominal Displayed Count
5 V	0 V	0	0.25V	1638	4.75V	31129
1 mA	0 mA		0.05 mA		0.95 mA	
5 mA	0 mA		0.25 mA		4.75 mA	
10 mA	0 mA		0.50 mA		9.5 mA	
20 mA	0 mA		1.0 mA		19 mA	

Notes

- Full-scale for all displayed DC analogs is represented by a range of 32767 to -32768 (15-bit plus sign value).
- Full-scale of DC Voltage and Current measurements is the nominal value.

Testing Hardware I/O Points, Continued

AC Voltage and Current Input Test

Testing AC Analog Inputs: Changes are displayed in WESMAINT.

Procedure: Test AC Voltage and Current Input

To conduct this test, the code and configuration file must be downloaded to the D25's FLASH memory.

Note: The actual point descriptions displayed in WESMAINT depend on the circuit configuration (i.e., line-to-line or line-to-neutral, etc.) and any changes made to the point descriptions in the running configuration file.

To verify that the correct AC voltage and current values are displayed in WESMAINT:

Step	Action
1	Navigate to the WESMAINT II+ System Data Menu.
2	On the **System Data Menu**, type **3 — Analog Input Display**.
PT input test	
3	Press the down arrow key to scroll to the point named *RMS Voltage Phase A Circuit 1*. (see Note: above)
4	Apply nominal voltage to the first AC voltage input termination points.
5	Verify that the measured counts are close to their nominal value.
6	Go back to Step 3 and repeat for other points on the AC voltage (PT) input termination.
CT input test	
7	When voltage input tests are complete, press the down arrow key to scroll to the point named *RMS Current Phase A Circuit 1*
8	Apply nominal current to the first AC current input termination points.
9	Verify that the measured counts are close to their nominal value.
10	Go back to Step 7 and repeat for other points on the AC current (CT) input termination.

Testing Hardware I/O Points, Continued

Note

Only points used by the Plant I/O, based on downloaded configuration, will display values.

Unused points will be off-line.

Table: Reference Values

Use this table as example references for the AC analog input verification test.

Note: Nominal values can be determined by reviewing ConfigPro's P097 Plant I/O configuration tables for this device.

Point Description	Nominal Value
Voltage Phase A Circuit 1	13107
Voltage Phase B Circuit 1	13107
Voltage Phase C Circuit 1	13107
Current Phase A Circuit 1	2048
Current Phase B Circuit 1	2048
Current Phase C Circuit 1	2048
Neutral Current Circuit 1	2048
Voltage Phase A-B Circuit 2	13107
Voltage Phase B-C Circuit 2	13107
Current Phase A-B Circuit 2	2048
Current Phase B-C Circuit 2	2048
Neutral Current Circuit 2	2048

Notes

- Full-scale for all AC analog values displayed in WESMAINT is represented by a count of 32767 (15-bit plus sign value).
- Full-scale of voltage measurements is 2.5 times the nominal value.
- Full-scale of current measurements is 16 times the nominal value.
- For more detailed information, refer to the *D25 Plant I/O Subsystem Configuration Guide*.

Chapter 5: Configuring the D25 Software

D25 Software

D25 Software

The D25 is factory configured and tested. It contains all software required to be a fully functional system and upload and download configuration databases.

You may need to download configuration files to your D25:

- If the D25 has performed self-diagnostics and determined that the FLASH memory is either erased or corrupted
- Other test messages indicate that the FLASH memory has been erased or corrupted
- After maintenance or replacement work which has deleted the FLASH code files

Use this section as a guide for:

- An overview of the software and software tools you will use
- Information and procedures for maintaining code and configuration files
- How to test the functionality of the inputs and outputs controlled by the D25 Plant I/O
- A discussion of code and configuration files
- How to remove configuration files from memory
- How to install new or replacement code files using a serial connection

Overview

The D25 system software consists of two distinct components:

1. Base System
2. Applications

Base System Software

The Base System Software resident in the D25 provides a consistent, stable operating environment for the Applications that provide specific functionality to the D25.

The Base System Software consists of:

- Software that is resident on the BootROM
- Base Applications that are required for the operation of the hardware.

D25 Software, Continued

D25 BootROM

BootROM software is stored in replaceable EPROM. The BootROM contains:

- pSOS operating system software
- Device drivers to interface the pSOS with the system hardware and software
- Diagnostic tests required to verify the integrity of the D25
- The monitor interface for examining the system in a non-operational mode
- Startup code that verifies and initializes the application software
- A stand-alone system for low-level maintenance and troubleshooting.
  - All of the code in the D25 BootROM is duplicated in the standard Base application load. When the D25 is operating the BootROM applications, it does not refer to the applications in the FLASH code, and vice versa.

Base Applications

Standard D25 Base Applications that are present in every D25 are:

- WIN: the system database manager
- WESMAINT II+: allows an operator to examine and control data locally on the D25 system
- 68K Monitor: low-level system maintenance and diagnostic tools

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WIN

The **W**ESDAC **I**nterface **N**ode (**WIN**) is the database manager for the D25's System Point Database.

The System Point Database is central to the D25 software system All data flowing through the unit is stored in the WIN before passing on to its destination.

WESMAINT II+

The WESMAINT II+ is the D25's primary maintenance and diagnostic tool.

WESMAINT can be accessed in three ways:

1. Via the serial port on the front of the D25
2. Through a modem or other serial connection to a programmed COM port on the rear of the D25
3. Over a LAN or serial PPP connection, as a TELNET session from a remote network station

See above: WESMAINT II+, Accessing WESMAINT II+ Using a Terminal.

Front Panel LCD Software Configuration

A D25 fitted with an LCD panel must be equipped with the Data Display DTA (B062) application software to communicate with the panel.

Using Config Pro, specific D25 database input points are mapped into this software.

Front Pane Graphic Display Panel Software Configuration

A D25 fitted with a GDP must be equipped with Modbus DPA (A059) or DNP 3.0 DPA application software to communicate with the GDP. Using Config Pro, some or all of the D25's database points are mapped into this communication software.

Inside the GDP, these points are then mapped into the GDP graphic objects.

Note: Please contact GE for assistance in order to learn more about the configuration tools and settings available for GDP.

Downloading a Configuration

The D25's 68K Monitor

The 68K Monitor, available through WESMAINT, contains diagnostic tools that allow access to system level functions.

The D25's Monitors are resident in both the BootROM and the application bank (Flash memory):

- When operating from BootROM, the prompt that appears is **D25S>**
  - This mode is accessed *only* while the D25 is in a maintenance state
  - Forcing a D25 into this monitor will terminate any applications that are running
- When operating from Flash, the prompt that appears is **D25A>**.
  - This is the normal mode of operation, and can be accessed via WESMAINT at any time while the unit is operational

Using 68K Monitor

Using the Monitor requires detailed knowledge of the D25 architecture and functionality — both alone and as part of a larger system.

Refer to the *68K Monitor User's Guide* for complete instructions about command usage and availability.

Downloading a Configuration, Continued

About Code and Configuration Files

All D25 units require two distinctly different files to be loaded into memory before the unit will become operational:

- Code File
  - This file is created using GE Energy' Software Development System, and is used to define the applications that can be used in a D25 system.
- Configuration File
  - This file is generated using the ConfigPro configuration tool, and is used to enable and configure the operational characteristics of the applications defined by the code file.

Extremely Important

The **Code File** and the **Configuration File** loaded into any D25 *must match perfectly*:

- The applications and application versions used in the configuration files created using ConfigPro must be the same as the applications and application versions used to make the code file.

Any differences between the applications in the code and configuration files may result in erratic or unpredictable behavior of the D25

How can Configuration and Code File Mismatch Happen?

Here are some common ways that this can occur:

1. The wrong configuration file is accidentally downloaded into a unit. For example, based on a D25 that has a different code file installed. This can happen either:
   - Through a local serial ConfigPro download, or
   - Remotely over a LAN connection using TELNET or BootP
2. A code file is downloaded that does not match the configuration file that is presently resident in the D25's NVRAM
3. Either the code file or the configuration file has been corrupted, either before or during download

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How can Mismatch be Prevented?

1. Wrong configuration file: usually a result of operator or BootP Server configuration error, and can only be prevented by exercising care.
2. Mismatched code file: can be prevented by erasing any configuration file that may be resident in NVRAM *before* downloading a new code file.
3. Corruption: may require the regeneration of one or both files, and re-downloading.

Downloading a Configuration, Continued

What Happens when the Files do not Match?

A mismatch error between Code and Configuration files causes the D25 to reboot.

How Does the D25 React to This type of Error?

The D25's base system performs this procedure after each reboot:

1. Every time the D25 is rebooted, a counter is incremented.
2. If the D25 runs for 2 minutes without a reboot, this counter is cleared.
3. If the counter ever reaches 20, the base system invalidates the configuration by writing "KILL" into the configuration file without recalculating the file's CRC.
4. The base system then forces a system reset.
5. When the unit comes back up, the base system detects a configuration that is now invalid and creates a default configuration instead (or loads a stored back-up configuration, if it is available in memory).

Why is This Done?

This process is designed to protect systems that have fatal errors that cause the system to reset before the user can get into WESMAINT to fix the problem

While a user can always directly default the configuration by pressing <ESC> during the start-up sequence, this only works if the customer is physically present and connected to the WESMAINT port.

Since the D25 has the ability to receive files remotely over a LAN, the problem may occur when a user is downloading remotely and logging in over TELNET. An error that causes the system to constantly reboot could potentially continue forever, filling up NVRAM with many error messages. This process enables the D25 to eventually settle down on its own.

When to Erase a Configuration

Rule: If the code file is *not exactly the same* as the one that was in use before the download, then *erase* a configuration file from the D25's NVRAM *before* downloading a new code file into FLASH memory.

Downloading a Configuration, Continued

Procedures: Ways to erase a Configuration

There are three ways to erase a configuration file from the D25's NVRAM:

One Way

Step	Action
1.	Reboot the D25, and while it is starting, press the ESCAPE key. Results: This message pops-up: `Are you sure you wish to generate a default configuration [y\n]?`
2.	Type *Y* and press ENTER Results: The configuration will now be defaulted.

Second Way

Step	Action
1.	With a terminal connected to the D25's monitor, type *DHW* (**D**isplay **H**ard**W**are) or *SI* (**S**ystem **I**nformation) on older units. Results: A listing of information, including the start address and size of the NVRAM used for the configuration file is displayed. The NVRAM end address can be calculated by adding the NVRAM size to the NVRAM start address.
2.	Type F 00 <NVRAM Start Address> <NVRAM End Address> and press ENTER Results: The specified range of NVRAM will be filled with 0s, erasing any configuration file.

Third Way

Step	Action
1.	With the power removed from the D25, remove the battery on the WESDAC board for at least 15 minutes. Refer to page 102, Battery Replacement for a detailed procedure for removing and replacing batteries.

D25 Locked-up?

Use the **Third Way** to unlock a D25 that has been locked up through a code/configuration file mismatch.

Downloading a Configuration, Continued

Downloading Code Files: When to Download

There are two reasons for downloading firmware code files:

- If the D25 has performed self-diagnostics and determined that the FLASH memory is either erased or corrupt, then it will display the **D25S>** prompt on the system monitor when it requires code files to be downloaded.
- If the D25 software program features need to be changed or upgraded, the existing FLASH memory can be erased, and new code downloaded.

Choice of Three Processes

Three techniques for programming the FLASH memory are available. The technique to use depends on system options and network type.

The choices are:

1. A serial connection from a PC to the WESMAINT port, using third-party communications software.
   - This procedure is described below.
2. Use ConfigPro, either via a serial connection to the WESMAINT port, or via Ethernet using a TELNET and TFTP procedure.
   - These options are described in the ConfigPro On Line Help.
3. A third-party parallel port adapter and software utility is available to connect directly to the BDM port on the D25 WESDAC Board, which permits very quick downloads.
   - This is the procedure used during manufacture of the D25.

Insufficient Memory

When a new code image is downloaded into the FLASH memory of a D25, the amount of memory reserved for the configuration's data region, also referred to as the "Base" region, may not be large enough.

If this occurs, then the D25 locks-up and a message similar to this will be displayed:

```
The configuration's data region overlaps the current
Configuration Header (NVHEADER).  Relocate the
Configuration Header / NVRAM to <address>, or set data
size to <size> and re-download.  Application will NOT
be started.
```

If this message appears:

- Unlock the D25
- Increase the base region memory. Consult the ConfigPro Online Help for how to set the D25's **Device Properties** to increase the Base Region size.

Downloading a Configuration, Continued

Prerequisites for Serial Code Download

The following must be available before a FLASH code file can be loaded into a D25's FLASH memory:

- Windows PC with terminal emulation communication software loaded.
- The code file, in the Motorola S-record format, located on a local hard drive. If the file is located on a network or floppy drive, the download may be significantly slower.
  - This file typically will be named either:

    down.shx, or
    sal*xxxx*.shx
- A WESMAINT cable to connect the PC to the D25's WESMAINT port.

Before Starting

- This procedure will suspend all operation of the D25, and following the download, the unit will probably require a configuration download before it becomes operational.
- Consult your System Administrator for access and authorization to perform system download procedures.
- In Application Monitor, (i.e., when the **D25A>** prompt is displayed) configuration files can be downloaded — but code cannot be downloaded.
- To download code, System Monitor (i.e., when the **D25S>** prompt is displayed) must be running.

Procedure: Download files

Steps to download a firmware file to the D25's FLASH memory

Step	Action
	Access Application Monitor
1	Connect the WESMAINT serial cable from PC to the D25's WESMAINT port
2	Start terminal emulation communication software on the PC, and configure it as follows: – 9600 Bps – 8 bit – no parity – VT100 emulation – Xon/Xoff (software) flow control enabled

Note

If the D25 has no code file loaded, or it has detected a corrupt FLASH file, you will have to go directly to Step 8 and log directly into the monitor.

Downloading a Configuration, Continued

Procedure: Download Files (continued)

Step	Action
	Launch System Monitor
3	Log into WESMAINT.
4	Select option **2, System Functions**
5	Select option **3, 68K Monitor** Result: The **D25A>** prompt appears, indicating that the Application Monitor is running.
6	At the **D25A>** prompt type *rtb* ENTER For other available commands type *help* ENTER
7	At the **Return to the BootROM Operating System? (yes/no)** prompt, type ***yes*** ENTER Note: The monitor is not case-sensitive, but *Y* is *not* acceptable. Result: The system restarts.

Warning

Invoking the Return to BootROM command will completely disable the system.

	Login to System Monitor
8	After the restart is complete, press ENTER. Result: The **Login:** prompt displays.
9	Type the **login name** *harris* ENTER and **password** *rd* ENTER. Result: The system performs self-diagnostics to ascertain whether any Flash EPROM memory is in use. The **D25S>** prompt appears, indicating that the System Monitor is running.
	Clear FLASH EPROM
10	Type *erase* and press ENTER (not case-sensitive) Note: The recommended procedure is to clear Flash EPROM memory — no matter what the system check reveals.

Downloading a Configuration, Continued

Procedure: Download Files (continued)

Step	Action
11	Type *Y* and press ENTER at the **Do you wish to proceed?** prompt (not case-sensitive) Result: The system automatically verifies that Flash EPROM memory has been cleared. The **D25S>** prompt appears. The download can be started.
Optional Step 1: Speed-up communication to shorten download time.	

Warning

- **Changing the speed to a higher rate may increase the probability of a communication error, resulting in failure of the download procedure.**
- **Some third-party communication applications may not be capable of running at these higher speeds reliably.**

If you experience either of these limitations, leave the communication speed at the default value of 9600 bps.

12	Type *Baud 38400* ENTER (speeds up to 38.4 Kbps, may be chosen based on ambient EMI, cable length, PC and software limits etc.) Result: the monitor will now be communicating at 38.4 Kbps
13	Configure the **HyperTerminal** program to communicate at the same speed, and reconnect to the 68K monitor.
Optional Step 2: Provide feedback during download	
14	If the communication software you are using *does not* have any "progress indicator', such as **HyperTerminal**, echo can be enabled to visually display the code file on your monitor as it is transferred. This option can be usually found in the communication settings or properties of the communication program. Note: enabling echo may slow transfer slightly.

Downloading a Configuration, Continued

Procedure: Download Files (continued)

Step	Action
	Start Download
15	Type *dl* ENTER
16	Select **Send Text File** (or comparable command) from program menus. Note: Only Motorola S-Records can be downloaded.
17	Locate and select file to download.
18	Press ENTER to invoke the download procedure. Note: Download may take from 20 to over 45 minutes, depending on file size and speed of transfer. Result: The download completes, the **D25S>** prompt appears.

Download OK? If the transfer is incomplete or stalls, the transfer must be halted and restarted.

Complete Reboot the D25, watching the display on the PC monitor. Note that the D25's monitor speed will return to 9600 bps, if it was changed during the procedure.

If any error codes are displayed, the procedure may have to be repeated.

Chapter 6: Operating the D25

LED Indicators

Front Panel Indicators

The front panel has three sets of LED indicators, providing a visual indication of the operational status of the unit:

LED	Color and Function
OPERATION	
POWER	Green: on when power supply is operating normally.
RUN	Green: on when the D25 microprocessor system is running. With a Type III WESDAC board the **RUN LED** flashes at about 2 Hz, depending on processor load.
COMMUNICATIONS	
IED1 (COM 3) **IED2 (COM 4)** **XCOM 1 (COM 5)** **XCOM 2 (COM 6)**	Red: on to indicate whether and when each port is transmitting (TX) and/or receiving (RX): Note: XCOM indicators light *only* if card is installed.
CONTROLS	
LOCAL **REMOTE**	The D25 Plant I/O Subsystem monitors the state of the **CONTROLS** switch *only if* a control board is installed. If the **CONTROLS** switch is in the **REMOTE** position at startup: • green **LOCAL** LED lights immediately when the D25 is turned on. • green LED remains on until the D25's internal POST diagnostics are complete. • if the diagnostics do not pass, the indicator remains green. After the D25 has started up normally, the indicator should follow the state of the **CONTROLS** switch: • if the switch is moved to the **REMOTE** position, the red **REMOTE** LED lights after a momentary delay, and the **LOCAL** LED turns off. Local/Remote LEDs flashing indicate one or more active sealed-in outputs (only if a D25 High Current KE Control Output Module is present in the D25)

Controls Switch

Table: Controls Switch and States

The operation of the Controls switch *only* affects the circuitry that controls the digital output relays of the D25 control modules.

When operated, the switch has these functions:

Control State as indicated by LEDs	Function
LOCAL	• All physical digital outputs are disabled. • All active operations are aborted. • All digital output requests are rejected. • All queued requests are cleared. • All digital outputs return to the normally open condition as soon as possible and pending requests are eliminated. The D25 cannot operate any digital output points, and therefore permits the safe servicing of connected equipment and wiring.
REMOTE	Physical digital outputs are enabled, and can be operated at any time from: • a host (remotely), or • the WESMAINT II+ interface. Digital output requests are accepted and processed.
LOCAL / REMOTE FLASHING	Local/Remote LEDs flashing indicate one or more active sealed-in outputs (only if a D25 High Current KE Control Output Module is present in the D25)

Warning

The **CONTROLS** switch *does not* affect auxiliary digital outputs

Warning (D25 HCKE Only)

When moving L/R switch in Local position, all control outputs will be disabled **except outputs with active seal-in current level**.

When the front panel Local and Remote LEDs are flashing do not turn off the D25 IED power supply. Seal-in is in effect and breaking the current can damage the control card. Ensure there is no current present on the D25 HCKE (e.g. through an external current interruption in the respective circuit such as an auxiliary breaker contacts)

Controls Switch, Continued

Notes

Moving the **CONTROLS** switch into the **REMOTE** position will not turn on the **REMOTE LED** and allow the D25 to function remotely if the:

- D25 does not have a digital output card installed, or
- an installed digital output card malfunctions.

Using Current-Monitored Digital Outputs

Current-Monitored Digital Outputs

D25s equipped with a high-current control card are provided with 8 digital outputs that have current monitoring. The last 8 of the 32 points on the card (i.e. 25 – 32) are designated as the current-monitored points.

By default, current monitoring and seal-in is enabled in the D25 configuration. A point enabled for monitoring and seal-in operates according to the following rules:

Rules Current-Monitored Digital Outputs

- Only pulse type commands are accepted.
- If the current across the relay contacts exceeds the relay breaking current during the pulse operation, and clears before the pulse duration expires, the relay will open normally when the pulse duration expires and no alarm will be raised.
- If current in excess of the relay breaking current is detected across the contacts of the point when the pulse duration has expired, the contact will remain closed and a current seal-in digital input alarm will be activated to indicate the condition. The local/remote LEDs on the front of the D400 will begin flashing as well to indicate the presence of the condition. The alarm points are placed at digital inputs 148 to 155 in the D25 Plant I/O DCA (actual point number may be offset if there are DCAs placed before Plant I/O in the configuration).
- While a contact is sealed closed, additional control requests on the point are rejected. If the board is placed in local mode via the local/remote switch on the front of the D25, the contact will remain sealed.
- The contact will remain sealed closed until the excessive current clears or an override command is sent. If the excessive current clears, the relay will open automatically. No additional user input is required. Alternatively, an override command may be sent via a digital output. These digital outputs are placed at digital outputs 36 to 43 in the D25 Plant I/O DCA (actual point number may be offset if there are DCAs placed before Plant I/O in the configuration). If a control operation is sent to the override digital point for a sealed-in digital output, then the relay seal-in will be overridden and the relay opened. This may cause damage to the high-current control card if the excessive current is still present. The override points remain online even if the control is placed in local mode, to ensure that the option to override a sealed-in relay is always available.
- A current seal-in digital input alarm that is active due to seal-in will clear when the relay contact opens, whether due to clearing of the current or do to an override command being sent.
- D25 Plant I/O DCA will reject control requests sent to the seal-in override digital output for a point not under seal-in.

Using Current-Monitored Digital Outputs, Continued

Disabling Current Seal-In

Current seal-in may be disabled in the configuration on a point-by-point basis. Disabling seal-in should only be done if the associated relay has also been disabled for current monitoring in the hardware. A current-monitored point with seal-in disabled via configuration will behave as follows:

Rules for Disabling Current Seal-In

1. The associated seal-in digital input alarm and override digital output will be offline.
2. The seal-in alarm will not be raised if excessive current is present across the relay when the pulse duration expires.
3. If the hardware indicates that excessive current is present on the relay when the pulse duration expires, the software will automatically operate the contact override in the hardware to ensure that the contact opens

Chapter 7: Servicing the D25

D25 Maintenance

The D25 does not require any scheduled maintenance. Periodic inspection is suggested to ensure that:

- Unit has sustained no accidental physical damage
- Airflow is not obstructed
- Connectors and cables are intact and firmly attached
- Fuses are intact
- Battery condition is good

Servicing Tasks

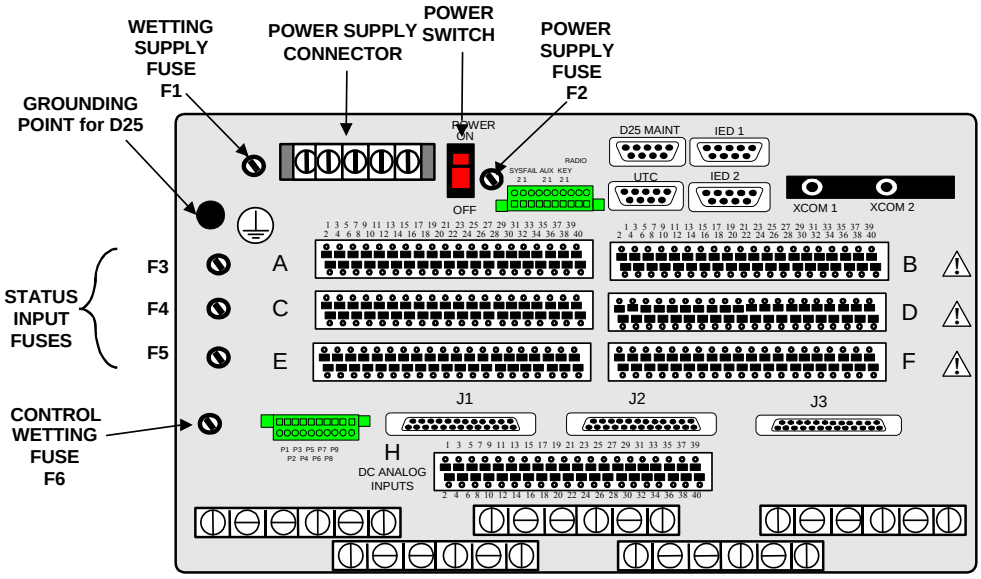
Use this section of the guide for regular servicing and preventative maintenance inspection tasks:

- The locations and standard values of all fuses
- How to disassemble and reassemble the unit
- Jumpers settings on the on Type III WESDAC board
- How to inspect and replace batteries on the main board

Fuse Replacement

Fuse Locations

In addition to the main power supply fuses, all Digital Input and Digital output modules are equipped with field replaceable fuses. Fuse locations for a typical D25 with 3 S-boards and a DB-25 terminated K-board:



Note: For fuses used by the K-4Z control module, See below: Table: Replaceable Fuses

Note

Fuses listed in the table below are the *standard* fuses that are factory installed, unless otherwise specified.

Fuse ratings may differ due to:

- Unique customer-specific configurations or requirements, or
- Product specification changes

When changing fuses, *always* check original fuse for value and type, and ensure the replacement fuse you use is of that value and type. Do not assume that installed fuse is of the correct value.

Fuse Replacement, Continued

Table: Replaceable Fuses *Standard* replaceable fuses that are used by the various hardware options.

Fuse	Board Type	Rating	Where Used	Fuse Part #
F1	521-0143	AGC 1.0A 250V	24V Field Supply	940-0021
	521-0145	AGC 1.0A 250V	24V Field Supply	940-0021
	521-0144	MDL 0.5A 250V	48V Field Supply	940-0215
	521-0146	MDL 0.5A 250V	48V Field Supply	940-0215
F2	521-0143	AGC 3A 250V	LVPS Power Fuse	940-0007
	521-0145	MDL 0.75A 250V	HVPS Power Fuse	940-0024
	521-0146	MDL 0.75A 250V	HVPS Power Fuse	940-0024
	521-0144	AGC 3A 250V	LVPS Power Fuse	940-0007
F3, F4, & F5	517-0485	AGC 0.25A 250V	12V / 5 mA Wetting	940-0023
	517-0486	AGC 0.25A 250V	24V / 5 mA Wetting	940-0023
	517-0487	AGC 0.25A 250V	48V Wetting	940-0023
	517-0490	AGC 0.5A 250V	24V / 10 mA Wetting	940-0009
	517-0488	AGC 0.10A 250V	120V Wetting	940-0155
	517-0489	AGC 0.10A 250V	250V Wetting	940-0155
F6	All KE	AGC 1.0A 250V	Control Voltage Fuse	940-0021
	517-0454	AGC 1.0A 250V	Control Voltage Fuse	940-0021
	517-0455	AGC 1.0A 250V	Control Voltage Fuse x 8 ch	940-0021

Battery Replacement

WESDAC (Main Board) Battery

The WESDAC Board is mounted vertically immediately behind the front panel. It is the first component visible when the front panel is removed.

Locate the **Panasonic® BR^2/$_3$A** (or equivalent) lithium battery near the top-left of the Type III WESDAC board. It is provided to maintain the contents of the NVRAM when the unit is powered down.

Refer to Battery Replacement on page 102 for information on changing this battery.

20 MB Memory Expansion Board Battery

Locate the **Tadiran® TL-2100S** (or equivalent) lithium battery on the 20 MB Memory Expansion Board. It is provided to maintain the contents of the NVRAM when the unit is powered down.

Refer to Battery Replacement on page 102 for information on changing this battery.

Battery Checking

Check battery voltage using a meter or other measuring device that has a high input impedance (10 MΩ or higher).

Cleaning & Handling of Lithium Batteries

- Use non-conductive cleaning solution to prevent deterioration of battery performance.
- Dry batteries at a temperature below 85° C to prevent seal deformation that may, in turn, result in leakage.
- Avoid:
  - inversion of polarity
  - exposure to high temperatures, such as soldering or spot-welding
  - excessive force to terminals
- Wear gloves or finger caps when handling batteries to keep them clean.
- For long-term storage
  - keep at temperatures and humidity below normal
  - avoid shorting or loading while stored.

Battery Replacement

If the battery is disconnected, or if the D25 is never powered down, the life of the battery should exceed five years.

The life of the battery will be severely shortened if the battery is left connected while the D25 is powered down for extended periods or stored.

The battery can be changed with power applied to the D25, so that service is not interrupted.

Note: The status of the battery is provided during the D25 start-up sequence.

Battery Replacement, Continued

Warning

- Removing the battery when the D25 is powered down results in loss of the configuration data and any other database information stored in NVRAM.
- Download the configuration file to restore operation.

Warning

- There are many electrostatically sensitive components near the battery.
- Extreme caution and proper procedures for servicing electrostatically sensitive components must be observed.

Recycling of Batteries

The D25 Lithium battery is recyclable and does not contain mercury, cadmium, or lead in levels above those regulated by the European Union. Recycle the battery according to local waste management regulations.

In accordance with European Directive 2006/66/EC, batteries are marked with the crossed out wheeled bin, which indicates that they cannot be disposed of as unsorted municipal waste in the European Union. Users of batteries must use the collection points available to customers for the return, recycling, and treatment of batteries. Customer participation is important to minimize the negative effects of batteries to the environment and sustain available natural resources. For more information see www.weeerohsinfo.com.

Procedure: Changing Battery

Changing the battery with power applied:

Step	Action
Battery Removal	
1	Using a plastic or other non-conductive tool, pry the black plastic clip holding the battery away from the battery holder.
2	When free, the battery and clip can be removed together.
3	Remove the clip from the battery, and retain.
Battery Replacement	
4	Place good battery into battery holder, carefully noting proper polarity.
5	Place clip retained during battery removal across the center of the battery, and press down until it clicks into the retaining notches in the battery holder.

Battery Replacement, Continued

Lithium Battery Disposal

Totally discharged lithium batteries can be appropriately disposed of as non-hazardous. Refer to *Recycling of Batteries* above.

Disposal of a fully or partially charged lithium battery as a hazardous waste can be done *after* it has been first neutralized through an approved secondary treatment.

Chapter 8: Upgrading and Replacing D25 Modules

Remedial Maintenance

If a board has failed on your D25 or you need to upgrade a specific component, use this section of the guide, which explains:

- How to remove and replace the main boards
- How to enable and disable Serial XCOM Radio Keying
- How to access and change Ethernet XCOM jumpers
- How to change the power supply jumpers
- How to change Input and Output cards and CT/PT interface modules
- How to reconnect power

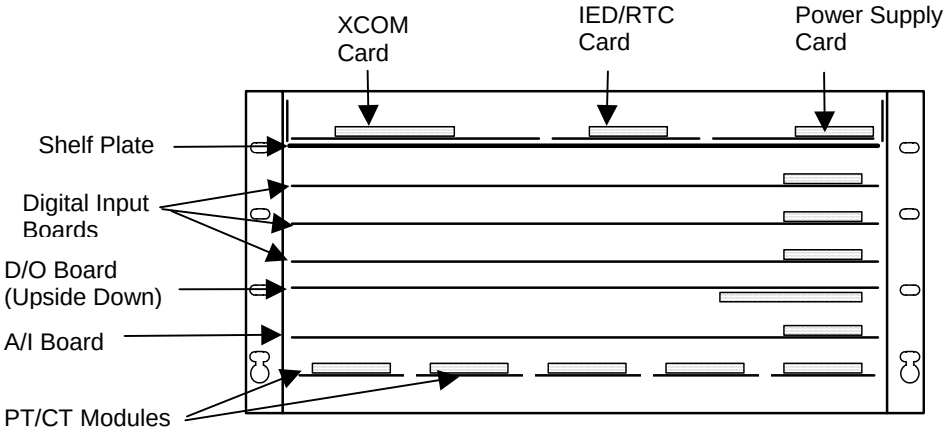
Module Replacement

About the D25 Modules

- All modules are accessed through the front of the enclosure.
- I/O modules can be removed and replaced without disturbing field wiring.
- Each printed circuit board (PCB) fits into a guide in the enclosure side panels.
- Each daughter board has self-aligning connectors to ensure correct insertion.
- All PCBs of different types are keyed to prevent improper insertion into the wrong location.

Component Location

With the front panel removed and the D25 WESDAC module removed, the modules are located as shown:



D25 PCB/Connector Layout
(Front View – WESDAC Card Removed)

Module Replacement, Continued

Disassembling the D25

You will need to disassemble the unit if it has sustained damage through physical or environmental factors, or if a module or option has to be interchanged to change functionality.

- Always disconnect the power source before servicing and removing components.
- Use the puller (located inside of D25 front cover, on the edge of the Indicator Switch Card) to remove and replace modules.

Warning

Always use the puller provided for removing and replacing all modules.

The high voltage area of the D25 High Current KE Digital Output Module is in close proximity to the D25 chassis. Ensure that relay contacts are de-energized before removing the D25 HCKE Digital Output Module.

Warning

Background on Connectors

- Connectors for field wiring the Digital Input, DC Analog input cards, and Digital output cards that use compression type connectors are permanently installed into the rear panel of the D25.
- Some Digital output modules have DB-25 connectors that are permanently attached to the module, not the rear panel.
- Connectors on the CT/PT transformers are permanently installed into the rear panel.
- CT/PT primaries are connected to the connectors by quick connect type of connectors.

Procedure: Disassembly

How to remove the front panel and expose the D25 WESDAC module (Main Board):

Step	Action	Comment
Lower the Front Panel		
1	Loosen the four (4) captive screws visible on the front panel	The front panel is hinged on the metal-formed hinges at the lower front edge of the D25.
2	Lower the panel	This will expose the inner cavity of the D25
Disconnect Indicator Switch Card		
3	Locate the connectors at either end of the ribbon cable.	
4	Push open the connector clips, and gently pull to remove the male connector at the WESDAC end of the cable	

Module Replacement, Continued

Remove the Front Panel		
5	With the ribbon cable disconnected, shift the panel to the right.	
6	Pull the panel towards the front to disengage the panel from the slots in the lower front edge of the enclosure.	The panel will now be free of the enclosure

Main Board

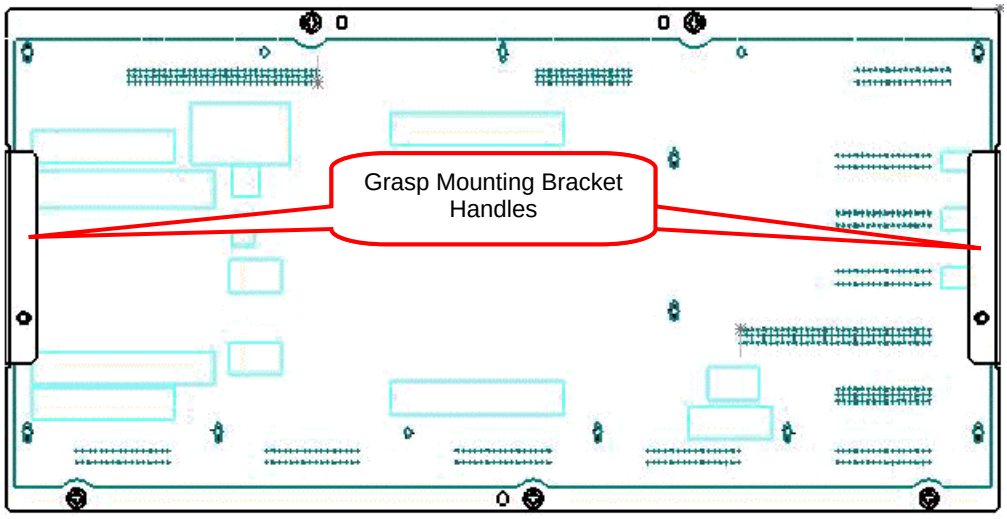
Procedure: WESDAC Board Removal

How to remove the WESDAC board.

Before starting this procedure, see above: Disassembling the D25.

Step	Action
1	Locate and loosen the captive screws that hold the metal mounting plate in the D25 housing.
2	Pull the metal mounting bracket at both sides of the WESDAC Board to disconnect connectors on back of board.
3	Tilt the module slightly so that the metal housing does not obstruct its removal.
4	Carefully slide the mounting plate and attached WESDAC Board out of the housing.

WESDAC Board Removal



Main Board, Continued

Type III WESDAC board jumpers and their functions:

Board Layout Drawing

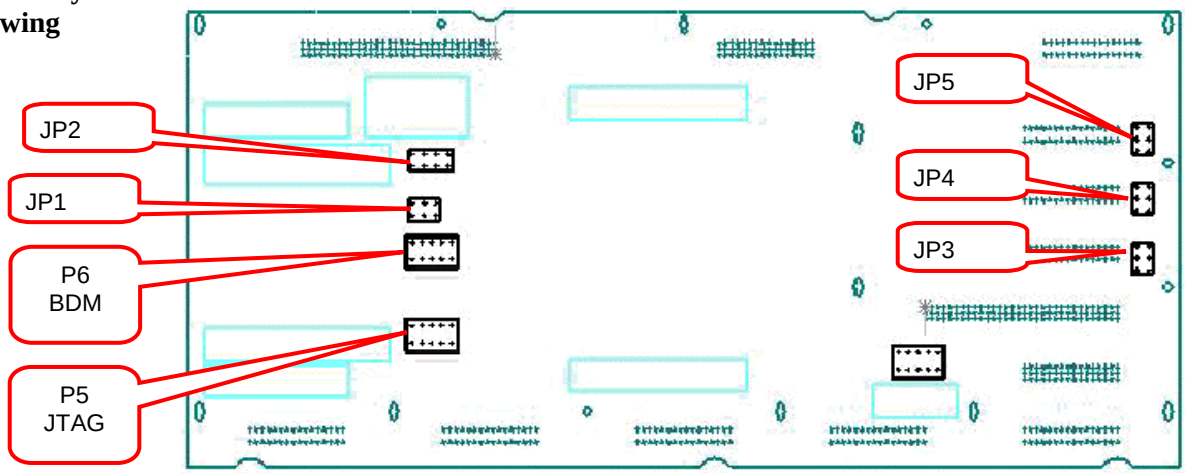


Table: Jumper Settings

Type III WESDAC board jumper settings.

Jumper	Function	Default Setting
P5	Factory use only	JTAG Connector, Do Not Jumper
P6	Factory use only	BDM Connector, Do Not Jumper
JP1	Factory use only, jumper 5 – 6 to enable JTAG for programming FLASH or EPLD	No Jumpers on any pins
JP2	Selects EPROM size, and allows for different FLASH memory options	Pins 3 – 5 shorted: 256K EPROM Pins 5 – 7 shorted: 512K EPROM

Backward Compatibility Jumpers

The following table shows the jumper setting for backward compatibility. **These jumpers cannot set the wetting voltage source of the CE Mark digital input cards.** (The wetting voltage must be routed externally for the CE Mark cards.)

JP3	Wetting for Low Voltage DI card #1	Pin 3 – 5 and 4 – 6 shorted: External or D25 power supply Pins 3 – 4 shorted: Voltage Sense Note: These jumpers not used with High Voltage DI Cards
JP4	Wetting for Low Voltage DI card #2	
JP5	Wetting for Low Voltage DI card #3	

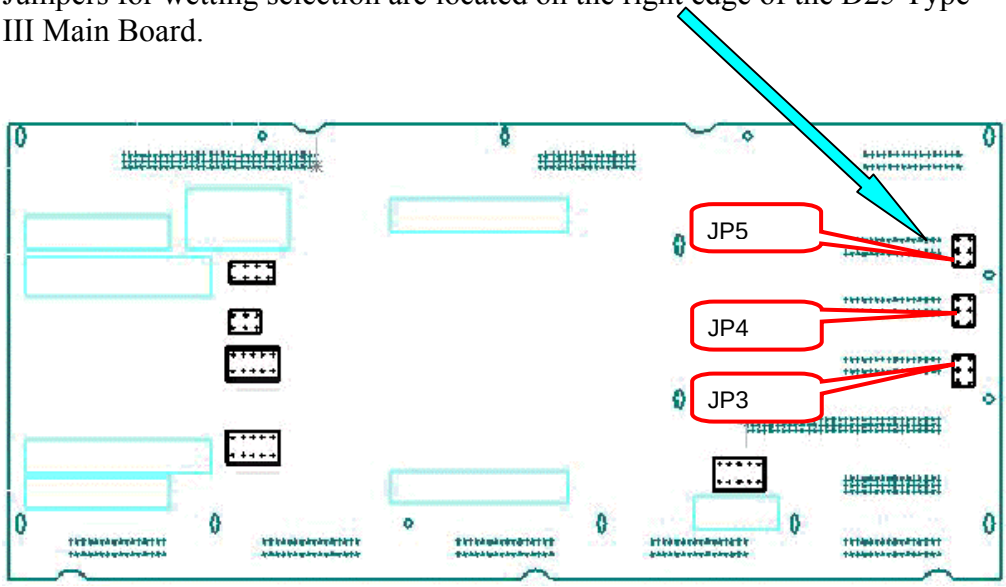
Reset Switch

The Type III WESDAC board does not have a “slide” reset switch.

Main Board, Continued

Low-Voltage Digital Input Card Wetting

Jumpers for wetting selection are located on the right edge of the D25 Type III Main Board.



Type III WESDAC:

When using low voltage digital input cards, the choice of external wetting supply source or voltage-detect input may be made using jumpers JP3 to JP5.

Low Voltage Digital Input Wetting Selection

To use external wetting supply:

- Connect external wetting supply to pins 1 and 2 on Connector A, C and/or E

Table: Backward Compatibility Jumper Settings

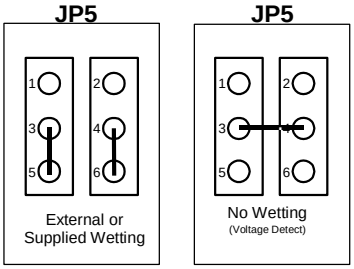
Type III WESDAC board wetting for backward compatibility with the following digital input cards: 517-0402, 517-0403, 517-0425, 517-0426, 517-0427, 517-0464, 517-0432, and 517-0433.

Digital Input	External & Supplied Wetting	Voltage Detect
1 to 32	JP5-3 to 5 JP5-4 to 6	JP5-3 to 4
32 to 64	JP4-3 to 5 JP4-4 to 6	JP4-3 to 4
65 to 96	JP3-3 to 5 JP3-4 to 6	JP3-3 to 4

Main Board, Continued

Type III WESDAC Wetting Jumper Detail (Backward Compatibility)

Jumpers shown are for the first (top) 32-point module. Jumpers (J4 and J3) for the other two modules work in the same way.



Note: Supplied wetting voltage is 24 or 48 Volts: depends on power supply used.

Note

Supplied Wetting option is not available if the Graphics Display panel is installed.

Procedure: Board Replacement

How to replace the WESDAC Board:

Step	Action
1	Hold the mounting brackets at each side of the module.
2	Tilt the card slightly, and insert the top first, ensuring that the battery connections do not come into contact with the metal housing.
3	Carefully position the board so that: – the alignment pins align with the holes at the top and bottom of the WESDAC Board – the captive screws align with their holes – the female connectors on the rear of the WESDAC Board align with the male connectors of other boards
4	Press the WESDAC Board firmly into position.
5	Tighten *all* the mounting screws to ensure the WESDAC Board connectors are firmly attached and the board is grounded.

DDSP Modules

DDSP Modules

Dual DSP (DDSP) modules contain the analog-to-digital conversion and digital signal processing (DSP) circuitry required for processing analog signals from the AC analog input cards.

The following DDSP variants are available:

- DDSP 32 MHz, 1 MB Memory (504-0009) – Special Order
- DDSP 50 MHz, 1 MB Memory (504-0011) – Obsolete
- DDSP 50 MHz, 2 MB Memory (504-0015)

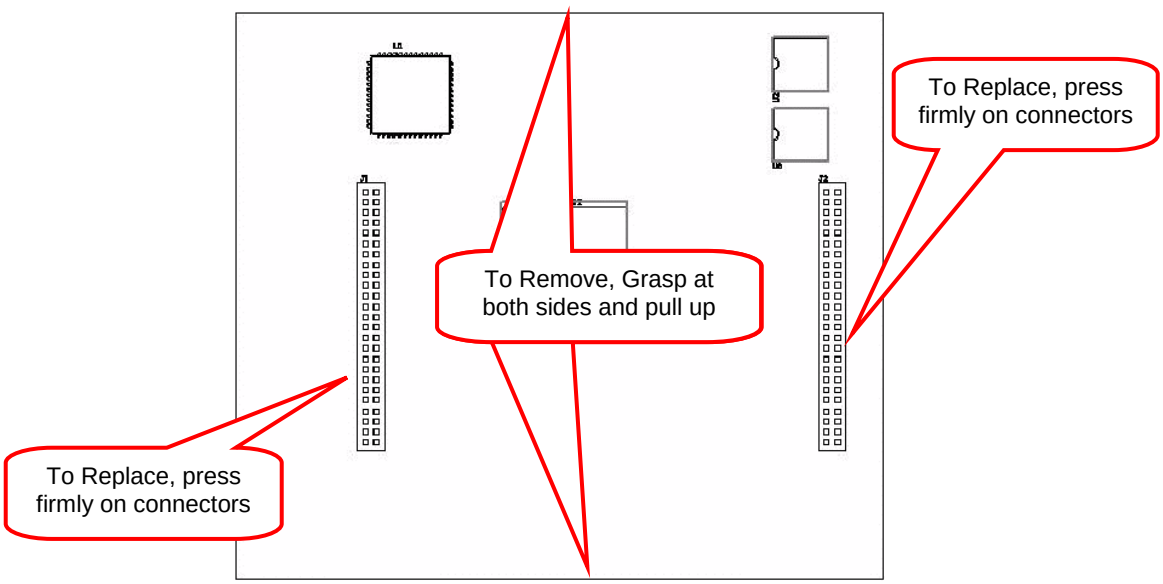
Location

DDSP board is mounted on top the WESDAC Board, just left of center.

Removing the DSP Board

Carefully grasp the board on both sides, and pull away from the WESDAC Board. A slight rocking motion may assist in freeing the board from its connectors

Diagram of Type I DSP Module



Note: The DDSP card is mounted with component side facing toward the WESDAC main board.

Replacing the DSP Board

1. Carefully position the DDSP Board on top of the WESDAC Board, and align the connectors.
2. Firmly press down on the connectors until completely meshed with WESDAC board connectors.

Warning

Polarized Connectors. The DDSP Cards can only be inserted right side up.

DO NOT ATTEMPT TO INSTALL UPSIDE DOWN.

Memory Expansion Board

Memory Expansion Board

Memory Expansion board is a general purpose RAM card that can provide extra memory for:

- larger, more complex configurations
- file storage for use by the oscillography waveform recording and power quality functions of the D25.

The module is a removable daughter card of the D25 WESDAC module.

Location

Memory Expansion module is mounted on top of the WESDAC (Main) Board.

Removing the Memory Expansion Board

Carefully grasp the board on both sides, and pull away from the WESDAC Board.

A slight rocking motion may assist in freeing the board from its connectors

Replacing the Memory Expansion Board

1. Carefully position the Memory Expansion Board atop the WESDAC Board, and align the connectors.
2. Firmly press down on the connectors until completely meshed with WESDAC board connectors.

Shelf Plate

Shelf Plate

The Shelf Plate is the metal plate that carries the Power Supply, IED/RTC card and the optional XCOM card.

Servicing or replacing any of these components requires the removal of the Shelf Plate.

Locking Brackets

Two Locking Brackets secure the Shelf Plate, one on each side of the enclosure.

These brackets are designed to prevent the accidental removal of the Shelf Plate when the WESDAC Board is pulled out of the enclosure

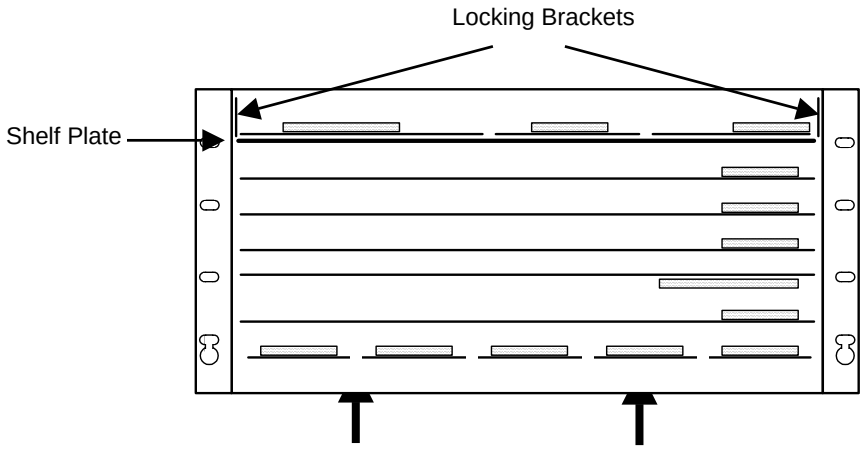
Remove all external connections from the IED/RTC card and/or the XCOM card before removing the Shelf plate.

External Connections

Shelf Plate, Continued

Shelf Plate Location

Each of the three cards on the Shelf Plate is connected to the WESDAC Board through a DIN connector.



Field terminations for the Power Supply are made through a five-pin connector positioned on the back panel of the D25.

Procedure: Removing the Shelf Plate

How to remove the shelf plate.

After removing all connections from the IED/RTC and XCOM cards:

Step	Action
1	Locate the two levers that secure the metal Shelf Plate in the D25 housing. Two labels, one on each side panel inside the enclosure, identify the Locking Bracket locations. **LIFT LATCH TO RELEASE**
2	Lift the front end of the locking bracket levers until they click into the up position.
3	Carefully slide the Shelf Plate and attached cards out of the housing.

Shelf Plate, Continued

Procedure: Replacing the Shelf Plate

How to replace the Shelf Plate:

Step	Action
1	Before inserting the Shelf Plate into the enclosure, lift the front end of the locking bracket levers until they click into the up position.
2	Align the Shelf Plate with the top card guides, and carefully slide the Shelf Plate and attached cards into the housing.
3	Firmly push the Plate into the housing until it is fully engaged into its grounding clips at the rear of the enclosure. Note: The Locking Brackets should fall back into a "locked" position. Check this by pulling on the Plate to see if it is secure.

Configuring Radio Keying Option

Configuring Radio Keying Option

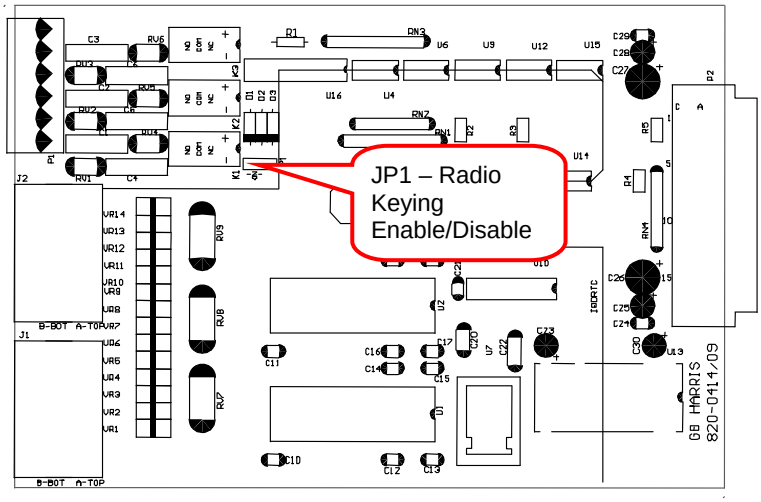
The IED/RTC board (Revision 7) includes a configuration jumper that can be used to enable or disable the Serial XCOM Radio Keying option.

Procedure: Option Change

Steps to access and change the JP1 option jumper on IED/RTC module:

Step	Action
1	Remove the shelf plate as described in the procedure on page 113.
2	Locate the jumper JP1 on the IED/RTC module you are using, referring to the following diagram.
3	Remove the JP1 jumper by pulling it straight up from its pins.
4	Reposition the jumper over the desired pins. Jumper JP1 pins 1 – 2 to enable radio keying Jumper JP1 pins 2 – 3 to disable radio keying
5	Push the jumper straight down onto the two pins
6	Replace the shelf plate into the D25 enclosure.

IED/RTC Card Layout Diagram



Ethernet XCOM Card

Changing Ethernet XCOM Option Jumpers

The Ethernet XCOM boards have configuration jumpers, with each of the two channels independently configurable with separate jumpers.

Jumpers are factory set to the most common application settings. If required, use the following tables to determine the settings for your application.

Procedure: Option Jumper Change

Steps to access and change the option jumpers on any of the Ethernet XCOM module variants:

Note: The *Channel* referred to in the following tables is the number of the XCOM port on the rear of the D25 enclosure. Connector numbering internal to the XCOM modules *may not* reflect the channel numbers.

Step	Action
1	Remove the shelf plate as described in the procedure on page 113.
2	Locate the necessary jumpers for the XCOM module you are using, using the tables on the following tables.
3	Remove the jumper(s) by pulling it straight up from its pins.
4	Reposition the jumper(s) over the desired pin.
5	Push the jumper straight down onto the two pins
6	Replace the shelf plate into the D25 enclosure.

Ethernet XCOM Card, Continued

Table: 10BASE2 Module Jumpers

** = Factory Settings, *do not* change.

Jumper	Name	Function	Default Mode	Default Setting
Z1	/TEST	Continuous Rx Clock, chan. 2	Disabled	**Out
Z2	/TEST	Continuous Rx Clock, chan. 1	Disabled	**Out
Z3	TSEL	Selects transformer or direct coupled output, chan. 2	Transformer coupled	**Out
Z5	TSEL	Selects transformer or direct coupled output, chan. 1	Transformer coupled	**Out
Z4	SQE	Channel 2 SQE test enable	Enabled	Out
Z6	SQE	Channel 1 SQE test enable	Enabled	Out

Tables: 10BASE-FL Jumpers

* = Default Settings

** = Factory Settings, ***do not*** change.

Jumper	Name	Function	Default Mode	Default Setting
JP4	/TEST	Continuous Rx Clock, chan. 2	Disabled	**Out
JP3	/TEST	Continuous Rx Clock, chan. 1	Disabled	**Out
JP6	TSEL	Selects transformer or direct coupled output, chan. 2	Transformer coupled	**Out
JP5	TSEL	Selects transformer or direct coupled output, chan. 1	Transformer coupled	**Out
Z8	Loopback	Channel 1 Loopback test enable	Enabled	In
Z10	Loopback	Channel 2 Loopback test enable	Enabled	In

Ethernet XCOM Card, Continued

JP1	JP2	SQE Test Channel 2	Jabber Channel 2
Out*	Out*	Enabled	Enabled
In	Out	Disabled	Enabled
In	In	Disabled	Enabled
Out	In	Disabled	Disabled

JP9	JP7	SQE Test Channel 1	Jabber Channel 1
Out*	Out*	Enabled	Enabled
In	Out	Disabled	Enabled
In	In	Disabled	Enabled
Out	In	Disabled	Disabled

Table: 10BASE-T Jumpers

Jumpers found on both revisions of the 10BASE-T cards. Note that they should not be modified for field applications.

** = Factory settings, ***do not*** change.

Jumper	Name	Function	Default Mode	Default Setting
JP1	/TEST	Continuous Rx Clock, chan. 2	Disabled	**Out
JP2	/TEST	Continuous Rx Clock, chan. 1	Disabled	**Out
JP4	TSEL	Selects transformer or direct coupled output, chan. 2	Transformer coupled	**Out
JP7	TSEL	Selects transformer or direct coupled output, chan. 1	Transformer coupled	**Out

Ethernet XCOM Card, Continued

Tables: Revision "0" 10BASE-T Modules

10BASE-T Ethernet cards that have 820-0431/00 revision of PC boards:

* = Default Settings

JP6	JP9	JP11	JP12	SQE Test Channel 1	Link Test Channel 1	Jabber Channel 1
Out*	Out*	In*	Out*	Disabled	Enabled	Enabled
Out	Out	Out	In	Disabled	Disabled	Disabled
In	Out	Out	Out	Enabled	Disabled	Enabled
Out	In	Out	Out	Enabled	Enabled	Enabled

JP3	JP5	JP8	JP10	SQE Test Channel 2	Link Test Channel 2	Jabber Channel 2
Out*	Out*	In*	Out*	Disabled	Enabled	Enabled
Out	Out	Out	In	Disabled	Disabled	Disabled
In	Out	Out	Out	Enabled	Disabled	Enabled
Out	In	Out	Out	Enabled	Enabled	Enabled

Caution!

Inserting jumpers JP5 and JP8, or JP9 and JP11 at *the same time* will result in possible damage to the Ethernet XCOM module or the D25's power supply.

Follow the information in the above tables carefully.

Ethernet XCOM Card, Continued

Tables: Revision "01" 10BASE-T Jumpers

Jumpers for 10BASE-T Ethernet cards that have 820-0431/01 revision of PC boards.

* = Default Setting

One jumper *only* used to make selection	SQE Test Channel 1	Link Test Channel 1	Jabber Channel 1
*JP6 Pins 4-6	Disabled	Enabled	Enabled
JP6 Pins 5-7	Disabled	Disabled	Disabled
JP6 Pins 1-3	Enabled	Disabled	Enabled
JP6 Pins 2-4	Enabled	Enabled	Enabled

One jumper *only* used to make selection	SQE Test Channel 2	Link Test Channel 2	Jabber Channel 2
*JP3 Pins 4-6	Disabled	Enabled	Enabled
JP3 Pins 5-7	Disabled	Disabled	Disabled
JP3 Pins 1-3	Enabled	Disabled	Enabled
JP3 Pins 2-4	Enabled	Enabled	Enabled

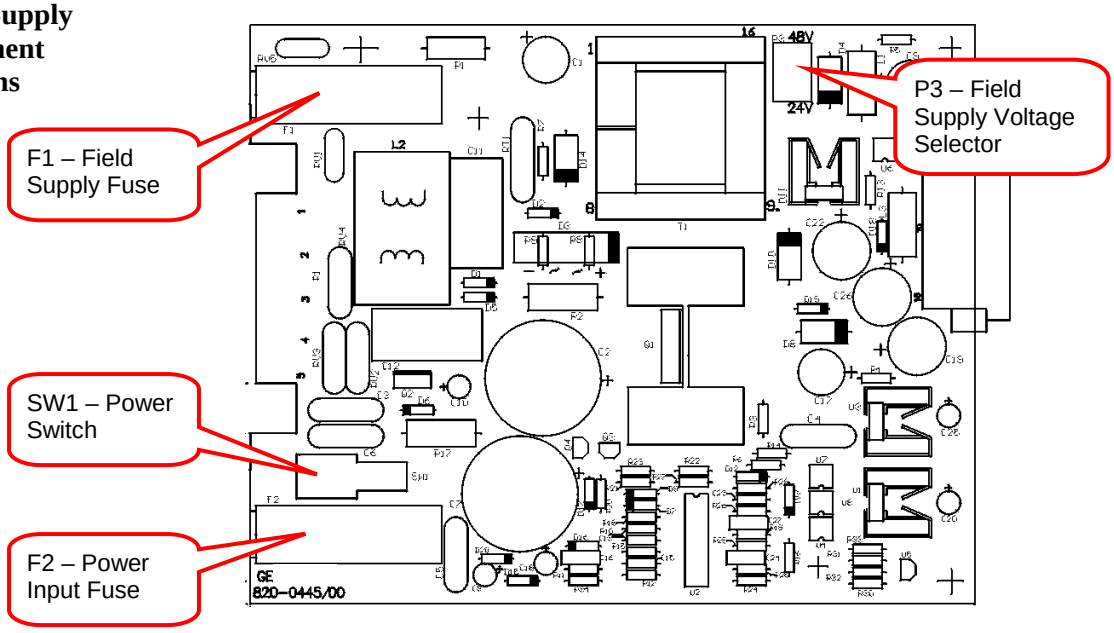
Power Supply Card

Table: Changing Power Supply Field Voltage Output

Optional power supplies equipped with a selection jumper to switch the field voltage output to or from 24 V or 48 Vdc.

Part #	Default Field O/P	Description
521-0143	24 V_{dc}	LVPS: 60 – 150 V_{dc} / 85 - 135 V_{ac}
521-0144	48 V_{dc}	LVPS: 60 – 150 V_{dc} / 85 - 135 V_{ac}
521-0145	24 V_{dc}	HVPS: 150 - 350 V_{dc} / 187 - 265 V_{ac}
521-0146	48 V_{dc}	HVPS: 150 - 350 V_{dc} / 187 - 265 V_{ac}

Power Supply Component Locations



Power Supply Card, Continued

Procedure: Output Voltage Change

Steps to change the field output voltage on any of the four power supplies:

Step	Action
1	Remove the shelf plate as described in the procedure on page 113.
2	Locate the jumper P3, as shown in the above diagram.
3	Remove the jumper by pulling it straight up from its pins.
4	Position the jumper over the P3 center pin and pin labeled 24V or 48V, as desired.
5	Push the jumper straight down onto the two pins
6	Replace the shelf plate into the D25 enclosure.
7	Remove the fuse F1 from its holder at the rear of the D25 enclosure
8	Replace the fuse with one of the correct value, as seen in this list:

Output Voltage	Fuse Type	Part #
24 V_{dc}	AGC 1.0A 250V	940-0021
48 V_{dc}	MDL 0.5A 250V	940-0215

Note

Changing the position of P3 changes the part number of the power supply. Be sure to record and/or label the power supply, identifying the change from the default settings.

Digital Input Cards

Digital Input S-Cards

A D25 may be equipped with up to three S-Cards.

Cards may not be the same part numbers: the wetting voltage may be different, so use care when replacing cards.

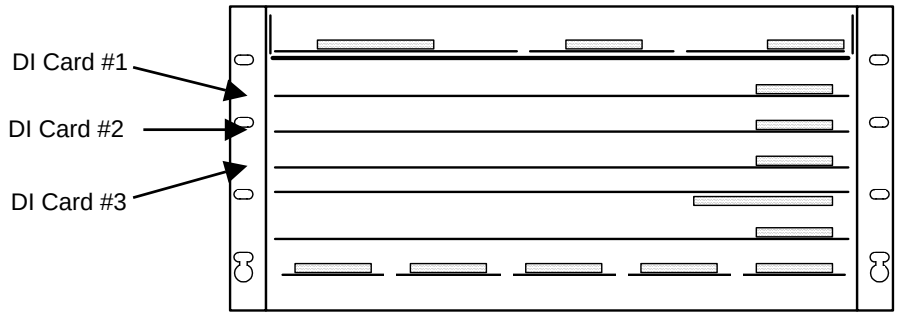
Field terminations for the digital inputs and external wetting power supply are made through two 40-pin card edge connectors positioned on the back panel of the D25.

Use Pullers

Always use the PCB pullers shipped with the D25 to remove and replace S Cards.

S Card Locations

Each S Card is connected to the WESDAC Board through a 2x16 pin DIN connector:



Removing the S Card

1. Use two PCB pullers to slide the S Card toward the front of the D25.
2. Use firm but gentle pressure to disconnect the card.

Replacing the S Card

1. Position the S Card on the slide guide, and carefully push the card into the D25 housing. Use the following table to determine the correct slot to insert the card.
2. Use firm but gentle pressure to push the card into place.

Table: Positioning S Cards

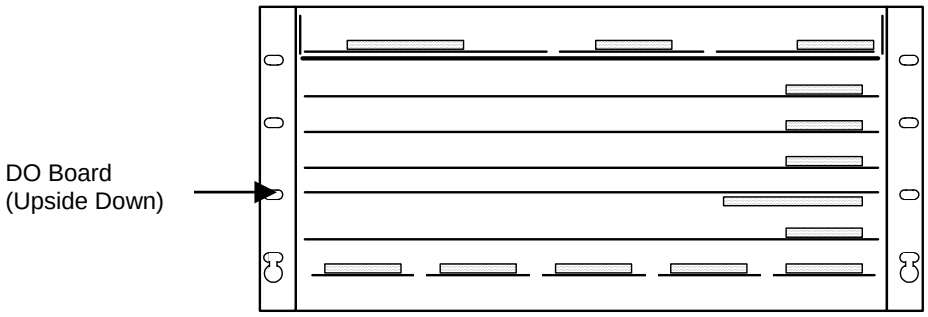
Use this table to determine the correct slot to insert the card.

Card	Inputs	Location
1	1 - 32	Second slot from the top of the D25
2	33 – 64	Third slot from the top of the D25
3	65 – 96	Fourth slot from the top of the D25

Digital Output Card

KE Card

Mount the KE Card component-side down in the fifth slot (from the top of the D25):



Use Pullers

Always use the pullers shipped with the D25 to remove and replace KE Card.

Warning

The high voltage area of the D25 High Current KE Digital Output Module is in close proximity to the D25 chassis. Ensure that relay contacts are de-energized before removing the D25 HCKE Digital Output Module.

Removing the KE Card

Using one PCB puller, slide the KE Card toward the front of the D25.

Use firm but gentle pressure when pulling the card out.

Replacing the KE Card

Position the KE Card component side down in the fifth slot from the top of the D25, and carefully push the card into the D25 housing.

Use firm but gentle pressure to push the card into place.

KE Card

The KE Card must be installed component side down.

Attempts to install the KE Card in any other orientation will cause damage to the components.

DC Analog Input Card

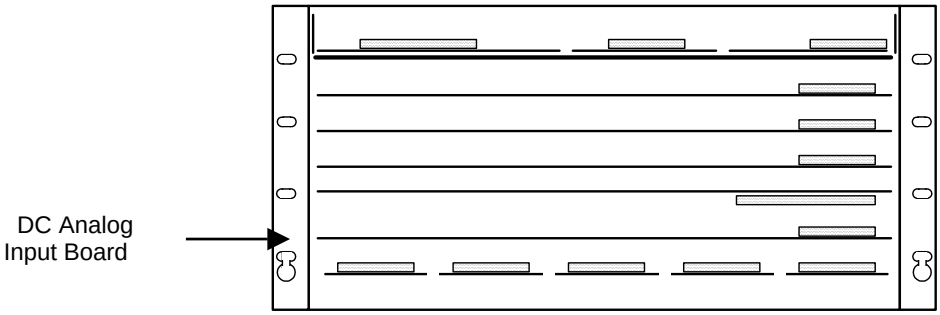
DC Analog Input Card

Refer to Appendix C: *Ordering Information* for part numbers.

Field termination is through one 40-pin card edge connector positioned on the back panel of the D25.

Location of DC Analog Card

The DC Analog Input Card is mounted on the lowest set of slide guides, or slot 6 from the top of the D25:



Use Pullers

Always use the pullers shipped with the D25 to remove and replace DC Analog Cards.

Removing the DC Analog Input Card

Use the pullers to slide the DC Analog Input Card toward the front of the D25.

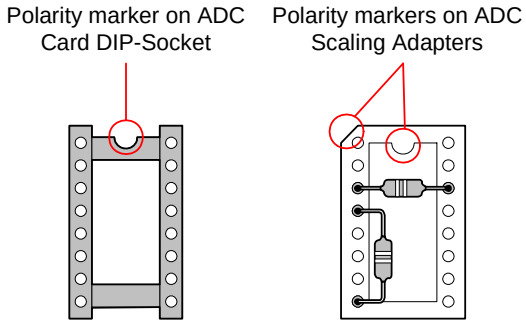
Use firm but gentle pressure when pulling the card out.

Replacing the DC Analog Input Card

Position the ADC Card on the lowest (sixth) slide guide from the top of the D25, and carefully push the card into the D25 housing. Use firm but gentle pressure to push the card into place.

Replacing the DC Analog Input Sacling Adapters

The scaling adapters are located on the DIP-sockets on the DC Analog Input Cards. To replace these remove the DC Analog Input Card from the D25. Carefully pull out the adapter from the DIP-Socket. When inserting new adapters ensure that their polarity/orientation is correct (see below).



CT/PT Modules

CT/PT Interface Modules

The CT and PT interface modules are field replaceable.

Each of the maximum five modules holds three CTs or PTs, for a total of fifteen transformers.

Use Pullers

CT input wiring must be shorted externally before servicing the CT transformers

- Open circuiting a Feeder CT will result in feeder voltage being present at the secondary of the CT.
- These Hazardous Voltages may result in equipment damage, shock, burns or death

Procedure: Removal

Steps to remove the CT and/or PT interface modules

Step	Action
1	Unplug the transformer connectors to disconnect the secondaries from the module.
2	Remove the module by sliding it toward the front of the open D25, then lifting it from the Snap-On PEM studs.
3	Move it forward and out the front of the open D25.

Procedure: Replacement

Steps to replace the CT and/or PT interface modules.

Note: The use of 42x nominal CT modules requires that you enter calibration factors in the D25's configuration. See: 42x Nominal CT Module

Step	Action
1	Move the card into position and lower it onto the Snap-On PEM studs.
2	Push it into the D25 until the card snaps firmly in place on the PEM studs.
3	Plug the transformer secondaries into connectors, observing proper orientation and arrangement. Transformer secondary wires should not cross each other.

CT/PT Modules, Continued

Removing or Replacing the CT/PT Transformers

CT input wiring must be shorted externally before servicing the CT transformers

- Open circuiting a Feeder CT will result in feeder voltage being present at the secondary of the CT.
- These Hazardous Voltages may result in equipment damage, shock, burns or death

---

Note

Before accessing the transformers, you must remove the modules mounted directly above.

Refer to the procedures on the previous page for removal/replacement of those modules.

Background

Due to the stiffness of the wires on the primary of the standard 5 A CTs, the transformers are manufactured with wires of two different lengths, to facilitate easier assembly into the bottom of the D25 enclosure.

The part numbers are as follows:

- Standard short lead 5 A CT: 450-0087
- Standard long lead 5 A CT: 450-0088

The optional 42 X 5 A CTs are manufactured with *both* long and short primary wires. The unused wire should be removed from the transformer when installed.

- 42 X Overcurrent long/short lead 5 A CT: 450-0108

If replacement 5 A CTs are required, be sure to order the transformer with the correct lead length.

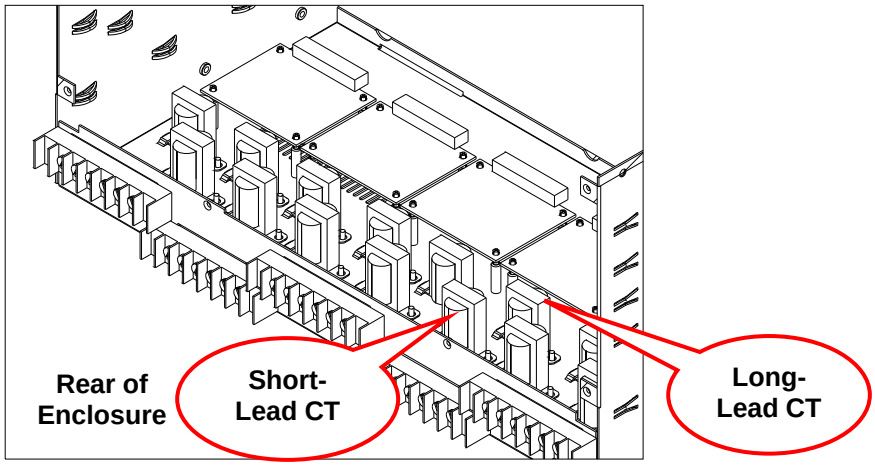
Note

Standard and 42 X overcurrent 1 A CTs, and all PTs, have leads flexible enough that two types are not required.

CT/PT Modules, Continued

Long/Short Lead Transformer Mounting Diagram

Short lead transformers are mounted in the row nearest the rear of the enclosure, Long lead transformers are mounted in the row closest to the front:



Note: The transformer's leads are omitted from the diagram for clarity.

Procedure: Removal

How to remove the **CT or PT** transformers from the D25 enclosure:

Step	Action
1	Disconnect the quick fasteners on the primary and secondary windings of the transformers.
2	Remove the single nut from the PEM stud
3	Lift the transformer off the stud, and slide it sideways until free of the slot in the bottom plate of the enclosure.
4	Lift the transformer out.

Procedure: Replacement

How to replace **CT or PT** transformers into the D25 enclosure:

Step	Action
1	Slide the end of the transformer into the appropriate slot in the bottom plate of the enclosure
2	Lower the other end of the transformer onto the PEM stud.
3	Tighten the nut onto the PEM stud.
4	Replace the quick fasteners onto the primary and secondary connection points.

CT/PT Modules, Continued

42x Nominal CT Module

To compensate for the current transformer's possible magnitude inaccuracy, it must be calibrated using a precision current source.

Use the following procedures to measure the magnitude error at both metering and over-current levels. Use your measurements to calculate the calibration factors to compensate for the gain error.

Note: The label inside the D25 box stating the compensation factors should be removed or corrected by the technician. A new label will not be supplied with the CT/PT modules.

Procedure: Metering Range Calibration (0% - 195%)

Steps to calibrate the transformer for inputs in the metering range:

Step	Action
1.	Using ConfigPro: • Set the calibration and correction factors for the phase and magnitude to the following default values: 1.00000 for magnitude, and 0.00000 for phase. – To set the calibration factors, go to D25 AC Configuration>Calibration tab>Internal Calibration tab – To set the correction factors, go to D25 AC Configuration >Calibration tab>External Correction tab. • Set the configured frequency to match the test signal's frequency (either 50 or 60 Hz). – To set the configured frequency, go to: D25 DCA Configuration>Advanced tab>Line Frequency • Set each input's magnitude point Report Deadband to zero and Averaging ON. – To set the Report Deadband, go to: D25 AC Configuration>I/O Configuration tab>Physical AC Analog Inputs>Report Deadband – To set the Averaging, go to: D25 AC Configuration>I/O Configuration tab>Physical AC Analog Inputs>Averaging
2.	Generate and download the configuration to the unit you are calibrating.
3.	For each input use a precision AC current source to inject the test currents indicated in the table in Step 4

CT/PT Modules, Continued

Procedure: Metering Range Calibration (0% - 195%) (continued)

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>4.</td><td>Using the D25 AC Input Engineering Value Displays (available through the B050-0 WESMAINT application), record the raw magnitude values for each input you are calibrating.

Verify that the reported values are within the following tolerances:

<table>
<tr><th colspan="3">CT Type: 1A Part Number: 450-0107</th></tr>
<tr><th>For Test Current…</th><th>Expected Raw Value is…</th><th>Tolerance</th></tr>
<tr><td>1.000 A_{rms} +/- 0.05%</td><td>2048</td><td>+/- 20 counts</td></tr>
</table>

<table>
<tr><th colspan="3">CT Type: 5A Part Number: 450-0108</th></tr>
<tr><th>For Test Current…</th><th>Expected Raw Value is…</th><th>Tolerance</th></tr>
<tr><td>5.000 A_{rms} +/- 0.05%</td><td>2048</td><td>+/- 20 counts</td></tr>
</table>
</td></tr>
<tr><td>5.</td><td>Calculate the 0-195% magnitude calibration factor for each input using the data gathered in Step 4.

Use the following formula:

Magnitude Calibration Factor = expected value / measured value

For example, if the measured value is 2045, the magnitude calibration factor is:

2048/2045 = 1.00147</td></tr>
<tr><td>6.</td><td>Enter the calibration factors in the Magnitude (0% - 195%) column for each input into the configuration
(under D25 AC Configuration > Calibration tab > Internal Calibration tab).</td></tr>
<tr><td>7.</td><td>Generate and download the configuration to the unit.</td></tr>
</table>

CT/PT Modules, Continued

Procedure: Metering Range Calibration (0% - 195%) (continued)

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>8.</td><td>Inject the test currents (see the following table) into the inputs, and use the D25 AC Input Engineering Value Displays to verify that the reported raw magnitudes are within the tolerances stated in the following tables:
<table>
<tr><th colspan="3">CT Type: 1A Part Number: 450-0107</th></tr>
<tr><th>For Test Current…</th><th>Expected Raw Value is…</th><th>Tolerance</th></tr>
<tr><td>1.000 A_{rms} +/- 0.05%</td><td>2048</td><td>+/- 4 counts</td></tr>
</table>
<table>
<tr><th colspan="3">CT Type: 5A Part Number: 450-0108</th></tr>
<tr><th>For Test Current…</th><th>Expected Raw Value is…</th><th>Tolerance</th></tr>
<tr><td>1.000 A_{rms} +/- 0.05%</td><td>2048</td><td>+/- 4 counts</td></tr>
</table>
</td></tr>
</table>

CT/PT Modules, Continued

Procedure: Over-current Range Calibration (195% - F.S.)

Steps to calibrate the transformer for inputs in the over-current range.

Step	Action
1.	Using ConfigPro: • Set the calibration and correction factors for the phase and magnitude to the following default values: 1.00000 for magnitude, and 0.00000 for phase. – To set the calibration factors, go to D25 AC Configuration>Calibration tab>Internal Calibration tab – To set the correction factors, go to D25 AC Configuration >Calibration tab>External Correction tab. • Set the configured frequency to match the test signal's frequency (either 50 or 60 Hz). – To set the configured frequency, go to: D25 DCA Configuration>Advanced tab>Line Frequency • Set each input's magnitude point Report Deadband to zero and Averaging ON. – To set the Report Deadband, go to: D25 AC Configuration>I/O Configuration tab>Physical AC Analog Inputs>Report Deadband – To set the Averaging, go to: D25 AC Configuration>I/O Configuration tab>Physical AC Analog Inputs>Averaging
2.	Generate and download the configuration to the unit you are calibrating.
3.	For each input use a precision AC current source to inject the test currents indicated in the table in Step 4

CT/PT Modules, Continued

Procedure: Over-current Range Calibration (195% - F.S.) (continued)

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>4.</td><td>Using the D25 AC Input Engineering Value Displays (available through the B050-0 WESMAINT application), record the raw magnitude values for each input you are calibrating.

Verify that the reported values are within the following tolerances:

<table>
<tr><th colspan="3">CT Type: 1A Part Number: 450-0107</th></tr>
<tr><th>For Test Current…</th><th>Expected Raw Value is…</th><th>Tolerance</th></tr>
<tr><td>4.000 A_{rms} +/- 0.05%</td><td>8192</td><td>+/- 200 counts</td></tr>
</table>

<table>
<tr><th colspan="3">CT Type: 5A Part Number: 450-0108</th></tr>
<tr><th>For Test Current…</th><th>Expected Raw Value is…</th><th>Tolerance</th></tr>
<tr><td>20.000 A_{rms} +/- 0.05%</td><td>8192</td><td>+/- 200 counts</td></tr>
</table>
</td></tr>
<tr><td>5.</td><td>Calculate the 195-FS magnitude calibration factor for each input using the data gathered in Step 4.

Use the following formula:

Magnitude Calibration Factor = expected value / measured value

For example, if the measured value is 8195, the magnitude calibration factor is:

8192/8195 = 0.99963</td></tr>
<tr><td>6.</td><td>Enter the calibration factors in the Magnitude (195% - FS) for each input into the configuration (under D25 AC Configuration > Calibration tab > Internal Calibration tab).</td></tr>
<tr><td>7.</td><td>Generate and download the configuration to the unit.</td></tr>
</table>

CT/PT Modules, Continued

Procedure: Over-current Range Calibration (195% - F.S.) (continued)

8.	Inject the test currents (see the following table) into the inputs, and use the D25 AC Input Engineering Value Displays to verify that the reported raw magnitudes are within the tolerances stated in the following table:

CT Type: 1A Part Number: 450-0107		
For Test Current…	**Expected Raw Value is…**	**Tolerance**
4.000 A_{rms} +/- 0.05%	8192	+/- 41 counts

CT Type: 5A Part Number: 450-0108		
For Test Current…	**Expected Raw Value is…**	**Tolerance**
20.000 A_{rms} +/- 0.05%	8192	+/- 41 counts

Reconnecting Power

Procedure: Reconnecting Power

If you have disconnected power for upgrade or replacement work, then follow these steps to reconnect the power source:

Step	Action
1	Unscrew the terminal block cover. Set screws aside.
2	Remove the terminal block cover.
3	If using DC power supply, connect the DC power supply, observing the correct polarity, to the +/L and -/N connection points on the terminal block TB1.
4	If using AC power supply, connect the AC line connection to the +/L connection point, and AC neutral connection to the -/N connection points on the terminal block.
5	Connect protective ground wire to the ground stud on the rear panel identified by this symbol: Note: The ground wire must be the largest gauge of all wires used for field termination. A 12 AWG green and yellow wire is recommended.
6	Replace terminal block cover

Power Source Precautions

- Power Source must be from a branch circuit that is protected by ***no more*** than a 15 Amp breaker
- ***Do not*** use wire larger that 14 AWG for the power connections.
- Auxiliary Ground terminal at the power supply terminal block ***must not*** be used as a safety ground connection.

Grounding

Make sure that the metal case is grounded at the protective ground stud located at the top-left corner of the rear of the enclosure.

Connection must be provided with separate green/yellow wire connected between the D25 and the protective earth system of the facility.

Chapter 9: Troubleshooting

This section provides guidance in troubleshooting system malfunctions and WESMAINT error messages:

- Runtime and start-up problems
- Initialization errors
- LAN-based errors

Note that Plant I/O errors are reported as changes in the state of specific digital input points. These events will be logged in the SOE Buffer Display in WESMAINT

In severe cases, the WESMAINT application may not run at all. If this happens, then access the system monitor, type *EL /P* and press ENTER to display a low-level error log.

If you fail to solve a problem, then contact GE Energy for assistance.

Run-time and Startup Problems

Table: Diagnosing Problems

Use the following table to diagnose problems with the D25:

Symptom	Possible Causes	Suggestions
Active Operations Aborted	Controls Switch is in the Local position. D25 Plant I/O Subsystem monitoring detects that the supply voltage is not available.	Move the Controls Switch to the Local position. Verify supply voltage source.
Active Requests Aborted	The D25 Plant I/O Subsystem monitoring detects a conflict between desired and actual coil status (a coil is not energized when it should be).	Verify coil status.
Digital Output Requests Rejected	Controls Switch is in the Local position. D25 Plant I/O Subsystem monitoring detects that the supply voltage is not available. The D25 Plant I/O Subsystem monitoring detects a conflict between desired and actual coil status (a coil is not energized when it should be).	Move the Controls Switch to the Local position. Verify supply voltage source. Verify coil status.

Run-time and Startup Problems, Continued

Symptom	Possible Causes	Suggestions
Queued Requests Cleared	Controls Switch is in the Local position. D25 Plant I/O Subsystem monitoring detects that the supply voltage is not available. The D25 Plant I/O Subsystem monitoring detects a conflict between desired and actual coil status (a coil is not energized when it should be).	Move the Controls Switch to the Local position. Verify supply voltage source. Verify coil status.
System Hangs	Watchdog failure	
Plant I/O Watchdog Failure	Plant I/O Subsystem integrity is faulty.	Remove and restore power to the D25.
Digital Output Points are Disabled	The Local/Remote switch is in the Local position.	Move the Local/Remote switch to the Remote position.
Digital Input Points Do Not Register	Incorrect wiring, Protection fuse is blown	Verify wiring, verify fuse is in place and is in good condition
Communication Watch Dog Failure	Internal system monitors detect serious errors.	
D25 Does Not Operate Remotely	The Local/Remote switch is in the Remote position, but the D25 does not contain a Digital output Card, or the Digital output Card malfunctions.	Verify that a Digital output Card is installed. Verify that the Digital output Card functions correctly.
Coil Status Check	The D25 Plant I/O Subsystem monitoring detects a conflict between desired and actual coil status.	Verify coil status.
Control Voltage Not Available	Output has failed.	
Hardware Watchdog	Digital output coils are not in the state requested by the software Plant I/O Subsystem failure	
Digital Output Failure	Control voltage not available, coil status check, hardware watchdog error condition, or protection fuse is blown	
RAM Check Failure	System start-up fails	Use WESMAINT II+ to view the error message.
NVRAM Check Failure	System start-up fails	Use WESMAINT II+ to view the error message.
Application Checksum Failure	System start-up fails	Use WESMAINT II+ to view the error message.
BootROM Checksum Failure	System start-up fails	Use WESMAINT II+ to view the error message.

Start-Up Failure	RAM check, NVRAM check, Application checksum, or BootROM checksum failed during system start-up	Use WESMAINT II+ to view the error message.
System Shut Down	RAM, NVRAM, FLASH, or BootROM internal system diagnostics failed	Use WESMAINT II+ to view the error message.
Only the System Monitor is Running	No valid application code is detected.	Load application code.
Code Download Failure	Download interrupted or data error encountered in downloaded file. Baud rate set too high.	Clear Flash EPROM memory. Restart download procedure. Reduce baud rate to 19200 or less.
Cannot Download Code	Logged into the Application Monitor	Exit Application Monitor, and launch System Monitor

Note: When using a D25 with a High Current Control Card (P/N 517-0492) installed, also consult the 'Using the Current-Monitoring Digital Outputs' for further details on rules regarding current monitoring and current seal-in.

Initialization Errors

Overview

The normal case is that the configuration and code in the Boot file match those in the memory of the client, thus causing the client to initialize immediately.

However, several error situations related to initialization can occur with file transfers.

Symptom	Possible Causes	Suggestions
BootROM Error	Corrupted or incorrect configuration loaded in NVRAM	Press 'y' during bootup to enter D25 system monitor, then download configuration.
TFTP ERROR	Configuration was not completed or data corruption has occurred at the server	Use WESMAINT II+ to view the error message.
Applications Not Enabled	Configuration was not completed or data corruption has occurred at the server	Use WESMAINT II+ to view the error message.
System Restarts	Data download failure	Use WESMAINT II+ to view the error message.
Only diagnostic input can be entered	No configuration is detected in either NVRAM or in EPROM on start-up	Download a configuration remotely via the system monitor, and reboot
System error	No configuration is detected in either NVRAM or in EPROM on start-up	Download a configuration remotely via the system monitor, and reboot

LAN-Based Problems

Overview

Several failure cases are possible in the BootP initialization sequence.

Under fault conditions such as loss of one or more devices, the system will continue to operate at whatever level of service is possible — even without LAN address, code, and configuration servers.

Notes

- BootP request time-out is factory set to 2 seconds.
- The default time-out is 5 seconds.

Symptom	Possible Causes	Suggestions
No response to repeated BootP request	BootP client times out without a valid response. Invalid code and/or configuration	Increase communication timeout. Verify BootP configuration
Null file name for the Boot file appears in the BootP response	BootP server either does not have a Boot File for the device or does not support TFTP read requests	Use WESMAINT II+ to view the error message.
Invalid information in the BootP response	BootP server does not have correct information available for the client. Either the system has not been completely configured, or the BootP server has suffered data loss or corruption.	Use WESMAINT II+ to view the error message.
Late response to BootP requests	Invalid information for the Boot File	Use WESMAINT II+ to view the error message.
Time Out	System waiting for a data block within a file transfer	Verify communication setup
Checksum Error	File download time-out	Verify communication setup, file integrity
Run Time Behavior	File name received in a write request is not the Boot File	Verify BootP configuration
Database Tables Created or Modified	File name received in a write request is not the Boot File	Verify BootP configuration
Diagnostics display locally only	Internal hardware verification failure	
Remote Display Failure	LAN stack and diagnostic interface failure	
Time-out	LAN address acquisition failed. Boot File Acquisition failure	Verify that code and configuration are the correct versions.
User Processing Halts	Restart sequence fails to verify address, boot file, code, and configuration	Load updated files for the restart sequence.
Restart Sequence Failure	Address, boot file, code, and/or configuration verification failure	Load updated files for the restart sequence.
Boot File Acquisition Failure	System times out	Verify communication setup
Code / Configuration File Acquisition Failure	iSCS device requires code or configuration	Load updated files for the restart sequence.

Reporting Problems

If the D25 crashes, call GE Energy for assistance. There is specific information that will help us to diagnose what is causing your system to crash.

D25 Installation

Gather the following information about the particular D25 installation that has crashed:

1. Are there any IEDs, relays, meters, etc. connected to the D25? If so, what are they, what protocol do they speak, and who manufactures them?
2. Are there any master stations or master remotes collecting data from the D25? If so, what are they, what protocol do they speak, and who manufactures them?
3. What communications equipment is connected between the RTU and other devices? (E.G. modems, media converters, line adapters, data concentrators, breakout boxes, protocol analyzers, etc.)
4. What are the media for the communications? (E.G., leased line, unlicensed radio, etc.)
5. What is the D25's part number? What are the part numbers of the installed D25 options? What is the serial number of the D25 and its chassis?

Note: In the case of a repeat crash where the D25 installation has not changed, you do not have to send the installation information to us again.

D25 History

We would like the history of the D25 that has crashed. Questions that you should be prepared to answer are:

1. Is the D25 in service? If so, how long has the D25 been installed in the field?
2. Has the D25 configuration changed recently?
3. Has the D25 software been recently upgraded?
4. Was there any unique weather pattern in the area of the D25 prior to the crash?
5. Were there any unique disturbances prior to the crash? (E.G. faults on line, breakers closing, communication problems, etc.)
6. Were there any field personnel on site during the crash?
7. Was any maintenance being conducted on the D25, the equipment in the vicinity of the D25, or equipment connected to the D25 prior to the crash?

68K Monitor Error Log

The 68K Monitor contains an error log, which can be displayed at any time. This error log contains a lot of useful information about the crash, including the exception vector information. Once in the 68K Monitor, type **EL /P** to print the error log and capture the output of this command to a text file using Windows HyperTerminal or other equivalent serial software.

Reporting Problems, Continued

D25 Configuration

We require the exact D25 configuration. It is very important for us to use exactly the same configuration. A different configuration causes the software to function in very different ways. We use the configuration extensively when tracing through the software execution.

Note: In the case of a repeat crash where the D25 configuration has not changed, you do not have to send the installation information to us again.

D25 EPROM/Flash

EPROM/Flash part number **SALyyyy/zz**, where:

yyyy: specific part number for your integration

zz: revision of your integration

We require the exact D25 software load in order to pinpoint the location of the exception vector. If the integration did not come from GE, we will need the following:

1. MODULE.MAK file
2. PROJ.MAP file
3. Any non-GE object files and ConfigPro application definitions
4. PROJ.LOC file
5. DOWN.SHX file for comparison

D25 BootROM

Please provide the BootROM part number SBFyyyy/zz or P104/P155-0 VER.zzz, where:

- yyyy: specific part number for your integration
- zz or zzz: revision of your integration

Note: It is important that the BootROM used matches the EEPROM/Flash part number. Althought there are generally less BootROM releases than EEPROM/Flash releases, it is important that your BootROM version matches or is compatible with the BootROM entry in the MODULE.MAK file used to integrate your EEPROM/Flash part number. If possible, please check that you are using the correct BootROM.

Reporting Problems, Continued

Crash Repeatability

We require a detailed description of the repeatability of the crash and what steps have been done to repeat the crash in your lab. This indicates to us just how intermittent is the crash problem. Intermittent problems typically take longer to resolve. Questions you should be prepared to answer:

1. Has the RTU crashed more than once?
2. What is the frequency of the crashes?
3. Is the frequency increasing or decreasing?
4. Have you been able to recreate the crash in your lab?
5. Does the frequency between your lab crashes differ from that in the field? If so how?

When investigating the repeatability of the crash, it is very important to gather information on the D25's resources. We can look for trends in the resources to see if it could be related. In the 68K Monitor, type the following commands *prior* to the crash:

- **QR /V** – Displays the free RAM in the RTU
- **QR /N** – Displays the free NVRAM in the RTU
- **PR /P** – Displays the CPU profile
- **EL /P** – Displays the current monitor error log
- **QP** – displays which processes are suspended, etc.
- **QX** – displays the contents of all message exchanges

Reporting Problems, Continued

Isolation

We require a detailed description of the steps you have undertaken to isolate the D25 crash and the results of each step. This minimizes any re-work and expedites a resolution. Questions you should be prepared to answer:

1. Have you been able to recreate the crash in your lab? In either case, detail the steps taken so far.
2. Does your lab setting differ from that in the field? If so how?
3. Have you been able to recreate the sequence of events that occurred in the field D25 prior to the crash?
4. What hardware components have you tried replacing and what were the results?
5. What firmware upgrades have you tried and what were the results?
6. What applications have you tried disabling in the configuration and what were the results?

If the D25 crash can be isolated, it is likely that it can continue to function, albeit with reduced functionality. Typically, D25 crashes are the result of one particular software application. If the application is disabled, the D25 will proceed to run normally:

7. Please list which applications you have disabled or modified in order for D25 to run.
8. Please detail what functionality has been disabled as a result of these field changes.

Restoring a Crashed D25

After collected all the required data, you will need to restore the D25.

1. First reset the 68K Monitor error log by typing EL /R, then type BOOT to reboot the product.
2. If the RTU crashes immediately after rebooting, re-download the configuration and reboot.

Appendix A: Product Specifications

Electrical Specifications

Power Supply	
Input Options:	
⎓	60-150 V_{dc} / 115 V_{ac} +/-10% 50/60 Hz
⎓	250 V_{dc} +/-20% / 230 V_{ac} +15%/-20% 50/60 Hz
Power Consumption	65 Watts (maximum)
Maximum inrush current on cold start (peak Amps)	18
Maximum inrush current under dynamic conditions of 5 seconds on and 1 second off (peak Amps)	45
Communication Ports	
Maintenance	WESMAINT II+ DB-9-F, EIA 232 @ 9600 bps
D25 Display	DB-9-F, EIA 485 @ 9600 bps
UTC Time	DB-9-F, EIA 232/422
Standard Serial Communication (2)	DB-9-F, EIA 232/485 up to 38400 bps software configurable
Optional XCOM (2)	DB-9-F, EIA 232/485 up to 38400 bps software configurable, or Ethernet/802.3 10BASE2, 10BASE-T or 10BASE-FL
Digital Inputs	
Up to 96 optically isolated digital inputs, organized in groups of 32 units	
"On" threshold options, per card	12, 24, 48, 120, 250 V_{dc} ±20%, bipolar inputs
Burden	From 0.75 mA to 10 mA max. power dissipation is 0.5W per input
Wetting Options	Supplied - 24 or 48 V_{dc}, isolated only, External wetting - for all input options
Digital Outputs	
D25KE	8, 16, 24, or 32 digital outputs with single component failure protection and detection, preventing false control of any coil driver output; select-check-before execute security; master trip/close bus scheme.

Electrical Specifications, Continued

Digital Outputs (continued)	
Output Relay Contacts:	
D25KE modules	1 From A
Maximum Switching Power	60 W (resistive) or 125 VA (resistive)
Maximum Switching Voltages:	
D25KE DB-25	75 V_{dc} or 50 V_{ac}
D25KE FACE-40	120 V_{dc}
Maximum Switching Currents:	
D25KE	2 A
Maximum Carrying Currents:	
D25KE	2 A
Interposing Relay Option	Groups of eight digital outputs can be directly interfaced to D20 KI modules
Digital Outputs – High Current Module	
D25HC KE	32 isolated digital outputs with single component failure protection and detection, preventing false control of any coil driver output; select-check-before execute security; 8 outputs with optional current supervision seal-in function
Output Relay Contacts	8x 1 From C; 16x 1 Form A and 8x 1 Form A with optional current seal-in function
Maximum Make Current	10A for 5 sec
Maximum Break Current	10A @ 28 $V_{dc;;}$; 0.85A @ 60 V_{dc}; 0.45A @ 120 V_{dc}; 0.3A @ 300 V_{dc}
Maximum Switching Voltages	300 V_{dc} or 300 V_{ac}
Continuous Carry Current	4A
Current Sensing Level for Seal-in Function	Min 60mA; max 200mA
Simultaneously Operated Outputs	Maximum 16, include max 4 with current supervision
Auxiliary Digital Outputs	
Three single digital outputs for System Fail indication, Radio Keying and Auxiliary Digital output	
System Fail Relay Contacts	1 Form B
Other Aux. Output Relay Contacts	1 Form A
Maximum Switching Power	60 W (resistive)
Maximum Switching Voltage	75 V_{dc} or 50 V_{ac}
Maximum Switching Current	2 A
Maximum Carrying Current	2 A

Electrical Specifications, Continued

DC Analog Inputs	
16 optically isolated differential inputs	
Measurement Range	120% of nominal
Overload Voltage	±30 V_{dc} (NM) continuous ±200 V_{dc} (CM) continuous
Nominal Voltage Input Range	±5 V_{dc}
Voltage Input Impedance	Greater than 10 MΩ
Nominal Current Input Range Options	±1 mA, ±5 mA, ±10 mA, or ±20 mA
Current Input Burden	5k to 250Ω (1 to 20 mA)
AC Analog Measurement	
Direct AC analog inputs from CTs and PTs. One to six 3-phase circuits. 15 AC analog inputs organized in groups of three (3) inputs, transformer isolated	
Line Frequency	50/60 Hz, nominal ±5 Hz
AC Voltage Inputs	
Nominal PT input options	63.5 V_{rms} 69.3 V_{rms} 110 V_{rms} 120 V_{rms} 220 V_{rms}
Measurement Range	0% to 250% of nominal
Overload Voltage	250% of nominal continuous 350% of nominal for one (1) minute
Burden	Less than 0.1 VA
AC Current Inputs (Standard)	
Nominal CT Input Options	1 A_{rms} 5 A_{rms}
Measurement and DFR Range	2% to 1600% of nominal, asymmetrical
Thermal Overload	4 times nominal current continuous 30 times nominal current 10 seconds 100 times nominal current 1 second Note: continuous over-current may affect the accuracy of the current values. Refer to the appropriate PRPI for the accuracy specifications under over-current conditions.
Burden	Less than 0.1 VA @ nominal input current

Electrical Specifications, Continued

AC Current Inputs (42x Nominal)	
Nominal CT Input Options	1 A_{rms} or 5 A_{rms}
DFR Range	42x nominal
Measurement Range	2% to 1600% of nominal, asymmetrical
Thermal Overload	4 times nominal current continuous 30 times nominal current 10 seconds 100 times nominal current 1 second Note: continuous over-current may affect the accuracy of the current values. Refer to the appropriate PRPI for the accuracy specifications under over-current conditions.
Burden	Less than 0.1 VA @ nominal input current
LCD Display	
Operating temp.	-20 – 70 degrees Celsius
LCD Display size	2.75” x 7.4”
Graphic Display Panel	
Operating temp.	0 – 50 degrees Celsius
LCD Display Resolution	320 x 240 pixels 0.36 mm pitch
Color	blue/black on white background
Viewable area	4.76” x 3.58”

Physical Specifications

Size and Environment	
Dimensions:	Width 19" (48 cm)
	Height 8.75" (22 cm)
	Depth 9" (23 cm)
Weight	33 lbs. (15 kg) maximum
Weight	33 lbs. (15 kg) maximum
Operational Temperature	-20° to +70°C 0° to +60°C with Alphanumeric Display (LCD) 0° to +50°C with Graphic Display Panel (GDP)
Maximum Ambient Temperature of D25 High Current Control Card	Continuous current: 45°C Up to 10 minutes: 65°C Up to 5 minutes: 70°C Note: Maximum ambient/working temperature of D25 High Current Control Card at 4 Amp current through 16 relay contacts including 4 with current supervision in a fully populated D25 enclosure with 48 V digital input cards using internal wetting with every other status input activated (48 out of 96).
Storage Temperature	-40° to +90°C -20° to +70°C with Alphanumeric Display (LCD) 0° to +70°C with Graphic Display Panel (GDP)
Humidity Rating	0 to 95% relative humidity, non-condensing
Environmental Rating	IP20
Installation / Overvoltage Category	Class II
Pollution Degree	2
Field Terminations	
Digital Outputs	Male DB-25 connectors for interconnect to an interposing relay panel or, 300 V_{dc} rated compression terminal blocks suitable for 22 – 14 AWG (0.2 – 2.0 mm^2) wire
Power Supply Inputs	250 V_{ac} rated barrier blocks, using 6-32 screws, suitable for 22 – 14 AWG (0.2 – 2.0 mm^2) wire
AC Analog Inputs	600 V_{ac} rated barrier blocks, using 6-32 screws, suitable for 22 – 12 AWG (0.2 – 2.5 mm^2) wire
Digital Inputs, Auxiliary Digital Outputs and DC Analog Inputs:	300 V_{dc} rated compression terminal blocks suitable for 22 – 14 AWG (0.2 – 2.0 mm^2) wire
Ground Stud	6-32 x 7/16 in. (10 mm) Note: Ground wire must be the largest gauge of all wires used for field termination. A green and yellow 12 AWG (2.5 mm^2) wire is recommended.

All insulated field-wiring conductors must be rated 300 V minimum.

Storage and Battery

Environmental Tolerance		
As a general rule, always store the D25 IED in an environment compatible with operating conditions		
Temperature:		
	Standard	-40° to +90°C
	Alphanumeric Display (LCD)	-20° to +70°C
	Graphic Display Panel	0° to +70°C with (GDP)
Relative humidity	0 to 95%, non-condensing	
Note: Exposure to excessive temperature or other extreme environmental conditions might cause damage and/or unreliable operation		

Battery
A **Panasonic BR^2/$_3$A**, or equivalent, battery will maintain the contents of the NVRAM for over 5 years, if system power is applied.
A **Tadiran Lithium battery, TL-2100S** or equivalent, will maintain the contents of the NVRAM on the 20 MB Memory Expansion board for over 1 year at 25°C. It will maintain the contents of the NVRAM for 15 years with system power applied
Note: If the D25 is to be stored for extended periods, you may wish to disconnect the battery. The Battery status is provided during the D25 start-up sequence.

Appendix B: Engineering Value Calculations

Conversion Formulas

Interpreting Data Values

This appendix provides information to assist the user in interpreting the data point values seen in WESMAINT.

- DC Analog Input Engineering value Calculation Formulas
- AC Analog and Accumulator Input Engineering value Calculation Formulas

Table: DC Analog Formulas

Formulas for converting DC analog input values from raw system database counts to engineering units:

Input Type	Engineering Value Calculation	Engineering Unit
Voltage	$\frac{RawCount * NomInputVoltage}{32767 * AnalInputScalingFactor * 0.01}$	V
Current	$\frac{RawCount * NomInputCurrent}{32767 * AnalInputScalingFactor * 0.01}$	mA

Conversion Formulas, Continued

Table: AC Analog & Accumulator Formulas

Formulas for converting AC analog and accumulator input values from raw system database counts to engineering units:

Input Type	Engineering Value Calculation	Engineering Unit
Voltage: (RMS, Symmetrical Components)	$\frac{2.5 * RawCount * Vnom}{32768 * 1{,}000}$ *Vnom* = Nominal input voltage	kV
Current: (RMS, Symmetrical Components)	$\frac{16 * RawCount * Inom}{32768}$ *Inom* = Nominal input current	A
Phase Angle	$\frac{360 * RawCount}{32768}$	Degrees
Frequency	50 Hz Circuit $\frac{(RawCount - 1) * 10}{32766} + 45$ 60 Hz Circuit $\frac{(RawCount - 1) * 10}{32766} + 55$	Hz
Power (per phase): Active, Reactive, Apparent	$\frac{RawCount * Vnom * Inom}{0.75 * 32768 * 1{,}000{,}000}$	MW, MVAr, MVA
Power (per circuit): Active, Reactive, Apparent	$\frac{4 * RawCount * Vnom * Inom}{32768 * 1{,}000{,}000}$	MW, MVAr, MVA
Energy (per phase): Active, Reactive, Apparent	$\frac{65536 * RawCount * Vnom * Inom}{Freq * 3600 * 0.75 * 32768 * 1{,}000}$	kWh, kVArh, kVAh
Energy (per circuit): Active, Reactive, Apparent	$\frac{65536 * 4 * RawCount * Vnom * Inom}{Freq * 3600 * 32768 * 1{,}000}$	kWh, kVArh, kVAh
THD, Voltage Unbalance	$\frac{100 * RawCount}{32768}$	%
Power Factor	$\frac{RawCount}{32767}$	
References	*RawCount*	

Appendix C: Ordering Information

The latest D25 ordering guide, which includes a spare parts list and accessories, is available for download from the GE Energy website:

http://www.gepower.com/prod_serv/products/substation_automation/en/controllers/d25.htm

MODIFICATION RECORD

VERSION	REV.	DATE	AUTHOR	CHANGE DESCRIPTION
1.00	1	March 12, 2003	S. Poda	Created
2.00	0	May 12, 2006	M. Haska	Merged with 994-0076, removed old information.
2.00	1	Dec 6, 2006	TCS-Sravanthi	Corrected Wetting options for High Voltage Digital Input cards. Clarify Case # 20061020-0254
				Changed part numbers 450-0116 to 450-0107 and 450-0117 to 450-0108. Clarify Case # 20061120-0372-1.
				Added note for serial input resistance in Communication ports section. Clarify Case # 20061102-0363.
				Added note (IRIG-B is received on CTS Port) to the IRIG-B notes in Communication ports section. Clarify Case # 20061027-0326-2.
2.00	2	Oct. 23, 2007	M. Haska	Updated ordering guide power supply option (1).
2.00	3	June 4, 2008	M. Haska	Updated p. 120 per CC#20080529-0279.
3.00	0	February 23, 2009	A. Poda A. Shoari Nejad S. Poda	Added High Current Control Card Updated Ordering Information, Obsolete parts Added product bulletin information Corrected Fuse Specifications in Fuse Replacement section
3.00	1	March 24, 2009	S. Poda	Removed D25KE FACE-40 specification row (p. 144) Added Max Ambient Temp Spec for HCKE (p. 147) Updated Chapter 9: Troubleshooting.

AUTHENTICATION RECORD

VERSION	REV.	DATE	P. ENG.	SCOPE OF AUTHENTICATION
2.00	1	Jan. 31, 2007	H. Kozlow	Change Description: Corrected Wetting options for High Voltage Digital Input cards. Clarify Case # 20061020-0254
				Change Description: Changed part numbers 450-0116 to 450-0107 and 450-0117 to 450-0108. Clarify Case # 20061120-0372-1.
				Change Description: Added note for serial input resistance in Communication ports section. Clarify Case # 20061102-0363.
				Change Description: Added note (IRIG-B is received on CTS Port) to the IRIG-B notes in Communication ports section. Clarify Case # 20061027-0326-2.
2.00	2	Oct. 23, 2007	H. Kozlow	Updated ordering guide power supply option (1).
2.00	3	June 4, 2008	H. Kozlow	Updated p. 120 per CC#20080529-0279.
3.00	0	March 5, 2009	H. Kozlow	Added Warning to product safety (chapter 1, p. 12) Added LCD panel overview section and Graphics Display Panel overview (chapter 2, p. 16 – 22) Updated control output section (p. 31) with entries related to D25 High Current KE Control Card Added D25HC KE with WESDAC Type III DAC entries to control section (p. 52 – 55) Added description related to D25 HCKE card (chapter 6 p. 94 – 96) Added "Using Current-Monitored Digital Outputs" section (chapter 6, p. 97 – 98) Added procedure "Recycling of Batteries" (p. 103) Added warning related to D25 HCKE card replacement procedure (p. 106 and p. 123) Added Note related to D25 HCKE use (p. 137) Added Electrical specification for D25 High Current KE Control Card (p. 144)
3.00	1	March 24, 2009	H. Kozlow	Removed D25KE FACE-40 specification row (p. 144) Added Max Ambient Temp Spec for HCKE (p. 147)